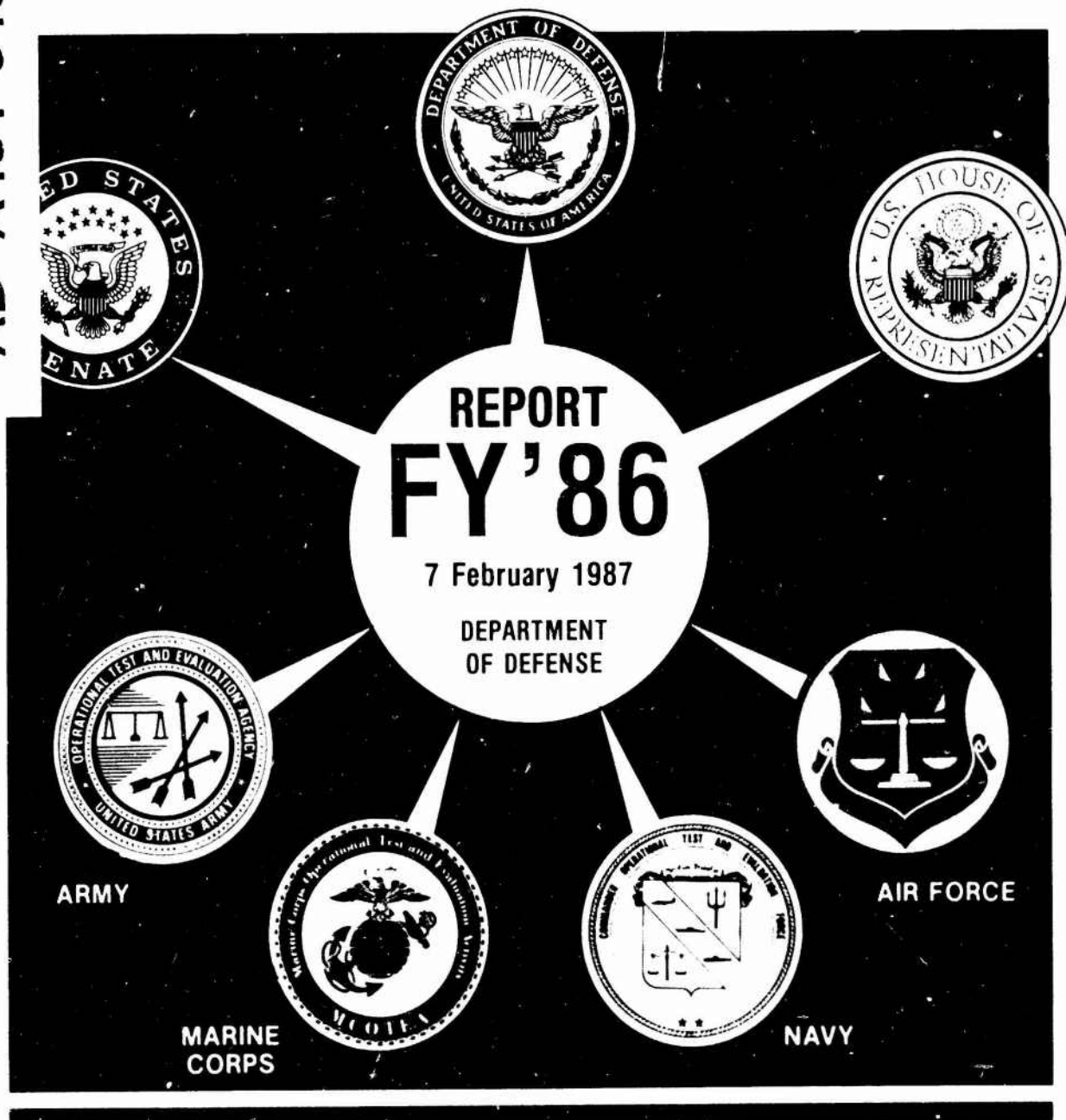


DTIC FILE COPY

DTIC
ELECTE
JUN 02 1987

DIRECTOR
OPERATIONAL TEST & EVALUATION

AD-A181 343



DISTRIBUTION STATEMENT A

Approved for public release
Distribution Unlimited

AD A181343

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188
Exp. Date: Jun 30, 1986

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY DOT&E			3. DISTRIBUTION STATEMENT A Approved for public release Distribution Unlimited		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) 87-001			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION Director, Operational Test and Evaluation		6b. OFFICE SYMBOL (If applicable) DOT&E		7a. NAME OF MONITORING ORGANIZATION	
6c. ADDRESS (City, State, and ZIP Code) Pentagon, 3E318 Washington, DC 20301-1700				7b. ADDRESS (City, State, and ZIP Code)	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (If applicable)		9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8c. ADDRESS (City, State, and ZIP Code)				10. SOURCE OF FUNDING NUMBERS	
				PROGRAM ELEMENT NO. 65118D	PROJECT NO.
				TASK NO.	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) Director, Operational Test & Evaluation Report FY' 86 (U)					
12. PERSONAL AUTHOR(S) Krings, John E.					
13a. TYPE OF REPORT Annual		13b. TIME COVERED FROM Oct 85 to Oct 86		14. DATE OF REPORT (Year, Month, Day) 87 Feb 07	
15. PAGE COUNT 200					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Operational Test and Evaluation, DOT&E, OT&E, Major Weapon Systems		
19. ABSTRACT (Continue on reverse if necessary and identify by block number) <i>See page V</i> This report is the annual report of DOT&E submitted to the Secretary of Defense and the Committees on Armed Services and on Appropriations of the Senate and House of Representatives. This report includes 5 Army major weapon systems: MCS, SINGARS, STINGER, TACCS and TRI-TAC; 19 Navy major weapon systems: A-63/A-6F, AIM-54 A/C PHOENIX, AV8B, BIGEYE, CIWS, CM/H-53E, AEGIS, ELF, F-14A/D, F/A-18, HARM, IR MAVERICK, LCAC, LSD-41, SH-60F, SM-2, S3 WSIP, TOMAHAWK, TRIDENT II; 18 Air Force major weapon systems: ALCM, AMRAAM, AN/ALQ-131, ASAT, B1-B, C-5B, CSRL, DSP MGS, GPS, GLCM, HARM, IR MAVERICK, JTIDS, LANTIRN, PAVE PAWS, PEACEKEEPER, TAON/ACE, T-46A; and one joint OT&E: JOINT CHEMICAL WARFARE (JCHEM). Also included in this report are the FY86 activity summary, budget activity and resource-management initiatives for DOT&E during FY86.					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL L. Student			22b. TELEPHONE (Include Area Code) 202/697-3125		22c. OFFICE SYMBOL DOT&E

NOTICE

This is an unclassified version of the FY 1986 Annual Report of the Director, Operational Test and Evaluation. The original, classified version of this report was submitted to the Secretary of Defense and the House and Senate Committees on Armed Services and on Appropriations on 7 February 1987, pursuant to the provisions of Section 138, Title 10, U.S. Code.

This unclassified version has been published in order to promote wider understanding of the role of operational testing in the development and acquisition of effective and affordable weapon systems.



Accession For	
NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By <i>ltr on file</i>	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

DIRECTOR'S INTRODUCTION

Fiscal Year 1986 was an eventful one for test and evaluation (T&E) in the Department of Defense (DoD). Much was accomplished by our office, both on a program-by-program basis and on broader policy and budgetary fronts. The particulars are covered in the body of this report. I believe they serve to validate the wisdom of Congress in establishing the Director, Operational Test and Evaluation (DOT&E) as an independent official in the first place, and in preserving and strengthening that independence in the landmark acquisition reform and reorganization legislation enacted last year.

Improvement of DoD T&E is a substantial challenge. Our approach to it is twofold. In the near term, we are instilling a new discipline in the T&E process to ensure that the best possible job is done within the limitations imposed by prevailing management arrangements and the less than satisfactory T&E resources and capabilities now at the DoD's disposal. Moreover, we are seeing to it that the impact of these limitations on our ability to assess each weapon system's capabilities is candidly spelled out for decision makers. At the same time, we have begun an ambitious long-term effort to acquire sorely needed T&E resources and to overhaul the way we manage both those resources and T&E oversight.

In this introduction, I focus on the long-term effort, discussing certain watershed events that took place during FY86 and on decisions and events that flowed from them during the first quarter of FY87. These have led to a significant new emphasis on and funding for T&E that is keyed to assuring procurement of combat effective and operationally suitable weapon systems and equipment. They have also focused Office of the Secretary of Defense (OSD)-level attention on the need for important T&E organizational changes to implement this new emphasis efficiently and effectively.

The submission of the Packard Commission's recommendations on defense management focused the attention of Congress and the DoD on new approaches to defense acquisition. In addition to emphasizing the need for streamlined defense acquisition, organization and processes, the commission noted the vital importance of early involvement of the operational test community in major defense acquisition programs and decried what it called the "divorce" of operational testing and developmental testing.

The DoD began to implement those recommendations of the commission that do not require changes in law. Meanwhile, Congress acted on legislation mandating other major revisions of the DoD acquisition system recommended by the commission, notably the establishment of the new position of Under Secretary of Defense for Acquisition (USD(A)), vested with the authority to oversee and direct acquisition activities throughout the DoD. This same legislation sustained and reinforced the independence of our office while underscoring the need for a cooperative working and advisory relationship between the USD(A) and the DOT&E.

One of the elements of DoD's effort to implement the Packard Commission recommendations was a comprehensive review of T&E techniques, policy and organization which the Secretary of Defense asked me to carry out last spring. This six-month review resulted in a report to the Secretary which recommended

a major overhaul of the DoD's T&E organization. The proposed changes are designed to provide T&E oversight at OSD and Service levels in a manner and with organizational and reporting arrangements parallel to but independent of the acquisition organization and process being established by the USD(A). The objective is to establish top-to-bottom institutional arrangements to: 1) provide comprehensive independent oversight of all T&E carried out in support of the acquisition process; 2) assure that the Secretary of Defense, USD(A), Congress and other decision makers have the full benefit of objective T&E information and assessments at every step of the acquisition process; and 3) provide for advocacy and utilization of, and efficient and effective investment in, T&E resources--all to the end of delivering combat effectiveness and operational suitability. My report and recommendations were submitted to the Secretary as FY86 drew to a close. The executive summary of that report is included here as an appendix.

As these efforts went forward, so did the FY88-89 DoD budget process. Our office identified significant shortfalls in operational test and evaluation (OT&E) capabilities and in related funding proposals in the Services' program objective memorandums (POMs). Similarly, as a result of a six-month study we carried out jointly with the Office of the Deputy Under Secretary of Defense for Acquisition (Test and Evaluation) (ODUSD(A)(T&E)), shortfalls were identified in our capabilities for testing space systems. (This study effort is described below in the body of this report.)

I carried these issues to the Defense Resources Board during the summer budget review. These presentations led the Deputy Secretary of Defense to direct the establishment of the DoD Test and Evaluation Council (DTEC) and to appoint me as its chairman. The DTEC is a permanent body charged with reviewing T&E resource, policy and budget issues and with making recommendations to the Secretary, Deputy Secretary and USD(A) for action.

The DTEC's first task was to review the requirements for improved OT&E and space-test capabilities and make recommendations to the Deputy Secretary to support decisions for the FY88-89 DoD budget. As a result, the Deputy Secretary decided: 1) that the need for improved OT&E capabilities was so urgent as to justify requesting a \$120 million FY87 supplemental appropriation for this purpose, with additional funding included in the FY88-89 request; and 2) that substantial funding in support of acquisition of improved space-test capabilities would be included in the FY88-89 request. (These funding requests are discussed in some detail below in the body of this report.)

Two new OSD program elements (PEs) were created for these efforts to provide a much needed national-level focus on management of T&E resources investment. Our office was charged with the responsibility for managing the OT&E capabilities PE (64340D) and the ODUSD(A)(T&E) with that for the space-systems test capabilities PE (64941D).

Our office has also just been authorized an additional 12 personnel spaces, bringing our total permanent authorization to 33 spaces. This augmentation will improve our ability to carry out our mission, but still leaves us with a significant shortfall that must be remedied as soon as possible. It is my hope that this will be addressed as part of an important T&E management initiative now under consideration in OSD and discussed below.

With the close of FY86 and the DoD's FY88-89 budget cycle, the need for dramatic improvement in DoD T&E capabilities and the contribution of T&E to the acquisition process was clearly recognized at the highest levels of the Department. The next step is new and more efficient organization of T&E oversight, assessment, reporting and resource management. Checks and balances are needed all along the way to keep the acquisition system focused on the bottom line of combat effectiveness and operational suitability from start to finish of every acquisition program.

The Department has under consideration a proposal to consolidate all OSD-level T&E functions in the Office of the DOT&E. This would entail transfer of the responsibilities, staff positions and other assets of the ODUSD(A)(T&E) to our office and the revision of pertinent DoD directives to preclude any possibility of compromising the objectivity of OSD T&E personnel, both in fact and appearance. Together with the additional 12 personnel positions recently authorized for the DOT&E, this would give the office a staff of 58.

Such a consolidation would:

- o For the first time, provide for oversight of all T&E in support of defense acquisition decisions by an OSD-level official independent of developing organizations and officials;
- o Make it possible to assure that every acquisition program is focused on fulfillment of operational requirements from inception to fielding by institutionally establishing a continuity of T&E oversight by the DOT&E;
- o Give acquisition decision-makers the benefit of timely, unfiltered, unbiased T&E information and assessments based upon a comprehensive and focused perspective on each program's T&E activity, progress and results;
- o Provide a T&E advocacy and information focal point at the highest level in the DoD--assuring that all T&E resource requirements and other concerns can be addressed candidly and fully in such forums as the Defense Resources Board and the Joint Requirements and Management Board and throughout DoD and congressional budget processes;
- o Establish a basis for guaranteeing that all T&E concerns (e.g., resources, test planning and scheduling, facilities utilization) are adequately addressed, planned for and accommodated throughout the life of each acquisition program; and
- o Enhance efficiency as called for by the Packard Commission by eliminating unnecessary duplication of effort at the OSD level and simplifying T&E reporting channels and information flow between OSD and the Services.

With the proposed consolidation, this office would have the staff positions, resources, assigned responsibilities and authorities it needs to accomplish fully the job Congress intended be done when it created the DOT&E. It is my firm conviction that the policy and budget decisions made by OSD

during FY86 and early FY87 have laid the foundation for a greatly enhanced ability to acquire weapon systems and equipment that meet the operational needs of the men and women of our Armed Forces, and to do so on a timely and cost-efficient basis. We must now erect the organizational structure needed to capitalize on this opportunity.

The DTEC is now completing a review of DoD T&E policy and organization in support of the Secretary's report to Congress on these issues required by the FY87 National Defense Authorization and Appropriations Acts (PL 99-661 and PL 99-591). The Secretary's report will provide a detailed presentation of the T&E policy considerations underlying the Department's revised approach to T&E oversight and resource investment, and I will be pleased to testify at any time on these and other T&E issues. Indeed, I welcome any opportunity to discuss our T&E philosophy and plans with all interested parties.

I sincerely hope that all concerned will come to share my belief that we are on the right path, and look forward to working with Congress, the leadership of DoD and the Services and the men and women of the T&E community in both government and industry to fulfill the promise that this new departure offers for our nation's defense.

A handwritten signature in black ink, appearing to read "John E. Krings", with a stylized flourish extending from the end of the name.

JOHN E. KRINGS
Director

CONTENTS

	<u>Page</u>
DIRECTOR'S INTRODUCTION	i
PART I DOT&E ACTIVITY SUMMARY AND PROGRAM OVERSIGHT	
FY86 ACTIVITY SUMMARY	I-1
PROGRAM OVERSIGHT	I-7
PART II POLICY AND RESOURCE-MANAGEMENT INITIATIVES	
POLICY INITIATIVES	II-1
RESOURCE-MANAGEMENT INITIATIVES	II-7
PART III ARMY OT&E	
MANEUVER CONTROL SYSTEM (MCS);	III-1
SINGLE CHANNEL GROUND AND AIRBORNE RADIO SYSTEM (SINGARS);	III-5
STINGER;	III-9
TACCS;	III-13
TRI-TAC (JOINT TACTICAL COMMUNICATIONS);	III-17
PART IV NAVY OT&E	
<i>MAJOR NAVY SYSTEMS: ALL-WEATHER ATTACK AIRCRAFT'S</i>	
A-6E/A-6F	IV-1
AIM-54 A/C PHOENIX MISSILE;	IV-3
AV-8B USMC LIGHT ATTACK AIRCRAFT;	IV-5
BLU-80B CHEMICAL WEAPON SYSTEM (BIGEYE);	IV-7
CLOSE-IN WEAPON SYSTEM (CIWS);	IV-11
CM/H-53E <i>NAVY TRANSIT HELICOPTER</i> ;	IV-13
DDG-51 (AEGIS) <i>GUIDED MISSILE DESTROYER</i> ;	IV-17
EXTREMELY LOW-FREQUENCY (ELF) COMMUNICATIONS SYSTEM	IV-19
FIGHTER-14A/D <i>ALL-WEATHER FIGHTER</i> ;	IV-23
FIGHTER/ATTACK AIRCRAFT (F/A-18);	IV-25
AGM-88A HARM <i>MISSILES</i> ;	IV-27
IR MAVERICK (AGM-65F);	IV-29
LANDING CRAFT, AIR CUSHION (LCAC)	IV-31
LSD-41 AMPHIBIOUS ASSAULT SHIP	IV-35
SH-60F <i>HELICOPTER</i> ;	IV-37
STANDARD MISSILE-2 BLOCK II (SM-2)	IV-39
S3 WISP <i>FISH FINDER</i> ;	IV-41
TOMAHAWK WEAPON SYSTEM	IV-43
TRIDENT II SUBMARINE;	IV-47

PART V AIR FORCE OT&E

→ **AIR FORCE SYSTEMS** ←

AIR LAUNCHED CRUISE MISSILE (ALCM)	V-1
AMRAAM (AIM-120A)	V-5
AN/ALQ-131 BLOCK II,	V-7
ANTI-SATELLITE WEAPON SYSTEM (ASAT)	V-9
B1-B STRATEGIC BOMBER	V-11
C-5B AIRCRAFT'	V-15
COMMON STRATEGIC ROTARY LAUNCHER (CSRL)	V-19
DEFENSE SUPPORT PROGRAM MOBILE GROUND SYSTEM (DSP MGS)	V-23
GLOBAL POSITIONING SYSTEM USER EQUIPMENT (GPS)	V-25
GROUND LAUNCHED CRUISE MISSILE (GLCM)	V-29
HARM (AGM-88A)'	V-33
IR MAVERICK (AGM-65D)	V-35
JOINT-TACTICAL INFORMATION DISTRIBUTION SYSTEM (JTIDS)	V-39
LOW-ALTITUDE NAVIGATION-AND-TARGETING INFRARED FOR-NIGHT SYSTEM (LANTIRN)	V-41
PAVE PAWS	V-45
PEACEKEEPER MISSILE'	V-47
TACTICAL AIR OPERATIONS MODULE/MODULAR CONTROL EQUIPMENT (TAOM/MCE)	V-51
T-46A	V-55

PART VI JOINT OT&E

JOINT CHEMICAL WARFARE (JCHEM)	VI-1
--------------------------------------	------

APPENDIX	A-1
----------------	-----

"OPERATIONAL TEST AND EVALUATION TECHNIQUES IN THE
DEPARTMENT OF DEFENSE: RECOMMENDATIONS FOR IMPROVEMENT"
(EXECUTIVE SUMMARY), REPORT TO THE SECRETARY OF DEFENSE
BY DIRECTOR, OPERATIONAL TEST AND EVALUATION,
24 SEPTEMBER 1986.

GLOSSARY OF ACRONYMS	G-1
----------------------------	-----

PART I
DOT&E ACTIVITY SUMMARY AND PROGRAM OVERSIGHT

FY86 ACTIVITY SUMMARY

FY86 has been a very significant year for the DOT&E office. The Director's first full fiscal year in office has been very active and important in terms of influence on individual programs and the formulation of test policy and new budget initiatives.

Perhaps the single most important event that occurred this year was the creation, by the Deputy Secretary of Defense (DepSecDef), of the DoD Test and Evaluation Council (DTEC) chaired by the DOT&E. The creation of this Council, discussed in more detail in the Policy Initiatives section, clearly signifies that the Department at the highest levels has recognized the importance of T&E. The DTEC was established during the summer Defense Resource Board (DRB) session as a permanent body with broad authority to review T&E policy and resource-related issues and report recommendations to the DepSecDef and Under Secretary of Defense (Acquisition) (USD(A)). The installation of the DOT&E as the chairman also sends out an unmistakable message that the Department wants T&E to have a strong, objective advocate. The DOT&E is now well established, with the opportunity to be heard and exert real influence. The paragraphs that follow summarize the activities of the office during FY86.

Manning. Including 5 overstrength (temporary assignment) positions, the DOT&E is currently authorized 26 personnel spaces. With the exception of a staff assistant for Naval Surface Warfare Systems, all positions were filled in FY86. Of these, 17 are professionals. In response to our request for additional end-strength (to a total of 40), which was revalidated on 1 October 1986, 12 new authorizations have been approved. In addition, a separate action to consolidate all testing responsibility under the DOT&E is being considered. Under that proposal, the 12 authorizations already approved would be added to the current 21 permanent (26 total less 5 overstrength) DOT&E authorizations, and an additional 25 authorizations would be transferred from the DUSD(A)(T&E), along with their DT&E, joint test, foreign weapons evaluation, NATO cooperative testing and resource oversight responsibilities. This would give the DOT&E a total personnel authorization of 58 spaces.

The Department appears poised to take an important step forward toward more efficient, independent oversight of T&E, a necessary step if we are to achieve the focused approach to T&E (procurement T&E) discussed in the Policy Initiatives section. In addition, as reported last year, the DOT&E obtains technical and analytical assistance from the BDM Corporation, the Institute for Defense Analyses and Electronic Warfare Associates.

Policy. The revised DoD Directive 5000.3, "Test and Evaluation," was published on 12 March 1986, and the associated Test and Evaluation Master Plan (TEMP) Manual (DoDD 5000.3-M-1) was published in October 1986. The responsibilities of the DOT&E and the DUSD(A)(T&E) (formerly DUSDR&E (T&E)) were clearly spelled out, along with test planning and reporting requirements, policy for early OT&E and detailed requirements (in the manual) for TEMP formulation. DoDD 5000.1, "Major System Acquisition," and DoDI 5000.2, "Major System Acquisition Procedures," were also published on 12 March 1986, highlighting the elevated importance of T&E as a decision factor in the acquisition process. Other key policy initiatives, in addition to the DTEC mentioned above, were the DOT&E report on operational test and evaluation techniques,

policy and organization in the DoD and the postulation of a new approach to T&E (procurement T&E) that focuses on procurement of operational effectiveness and suitability as an end product. Each is treated in the Policy Initiatives section, and the executive summary of the OT&E techniques report is included here as an appendix.

Program Oversight Activities. Title 10, U.S. Code, 138 requires DOT&E oversight of all Major Defense Acquisition Programs as defined in 138 and 2432(a)(1). Currently there are over 150 such programs, including DOT&E designated programs.

The impact of the DOT&E presence in the Department is clearly evident now, as demonstrated by the following selected examples. Because of contractor involvement in the OT&E effort, the DOT&E would not report out an assessment on the Air Force LANTIRN Navigation Pod program until the Air Force committed to an initial period of contractor support after deployment and a retest when technical data and trained military maintenance personnel were available. For the C-17, SRAM-II and small ICBM (SICBM), better up-front planning was demanded and obtained (SICBM); requirements were better stipulated and test reporting was rephased to be consistent with decision schedules (SRAM-II); and TEMPs (C-17, SRAM-II) were developed early, in time to meet Milestone II decision requirements.

We have also had an impact on compartmented programs. The stipulation of operational requirements for the ACM was improved and clarified, as was the rigorosity of testing. ATB up-front test planning was improved.

"Jointness" was imposed upon the BIGEYE and NAVSTAR GPS programs. At our insistence, the Navy and Air Force, which are to use the same BIGEYE weapon, have now combined their test at the same site and are using a truly joint test plan and a truly coordinated TEMP. The GPS test program was delayed until a joint approach was developed for testing what were essentially the same user sets.

As a result of our efforts, a Navy attempt to conduct OT&E on a very immature ASPJ system was deferred from the summer of 1986 to the summer of 1987. In this case, we were particularly interested in encouraging the delivery of an operationally effective and suitable system, not simply failing an inadequate or, as in this case, an immature system.

We have also been effective in the communications/information transfer program area. In JTIDS OT&E, we insisted on a more rigorous many-on-many approach that added more test tracks. We required a multi-Service test environment similar to that which would be found in combat, and we argued successfully in the JRMB that JTIDS was not ready (mature enough) for a beyond-LRIP decision. For SINCGARS, our influence resulted in system redesign for problems found in the in plant tests before OT&E; testing of more production-representative articles with more realistic density, interoperability and threat consideration; and deferral of full production until FY89, when the system is now likely to be ready.

As a final example, with FAADS, a very complex program that needs a lot of attention, we are still considering myriad options. Nevertheless, we have had some early impact. The pedestal mounted STINGER is an element of the

line of sight-rear portion of FAADS. Without our intervention, only the BASIC STINGER would have been tested. We are requiring that the STINGER POST be evaluated. A summary of DOT&E activities follows.

During 1986, five programs under DOT&E oversight reached the beyond-LRIP decision point: IR MAVERICK, DDG-51, E-6A TACAMO, AV-8B and TOMAHAWK (TLAM-C). All received favorable assessments and are proceeding into procurement. We also responded to congressional correspondence on several other programs, including BIGEYE, AMRAAM, BRADLEY and AEGIS.

The DOT&E participated in over 50 JRMB reviews or previews, JRMB-level program reviews, and Secretarial Program Reviews for various programs, including:

- SUBACS
- ATARS
- Air Defense A/C Competition
- AMRAAM
- ATACMS
- AAWS
- ATF
- TRIDENT II
- IR MAVERICK
- V-22
- GPS User Equipment
- Cruise Missiles
- JTACMS
- Sealance
- B-1
- ACM
- AAWS-M
- PHOENIX
- SINGARS
- Electronic Combat
- ATB
- SSN-21
- Army, Navy, Air Force new starts
- FAAD
- Small ICBM

TEMPs were received for comment and approval for over 25 programs, including:

- SSN-21
- Air-to-Air STINGER
- SRAM-II
- Small ICBM
- SPY-1 Radar Upgrade
- F-14 upgrade
- DDG-51
- C-17
- AN/ALQ-131 (V) Block II

GPS User Equipment
Fixed Distribution System
MK-50 Torpedo
Vertical Launch ASROC
AN/BSY-1 (V) Combat Control/Acoustic Set
RAM
HARPOON Missile Product Improvement
E-2C
HARPOON Block IC
Close-in Weapon System
MSE
V-22
JTIDS
BIGEYE
A-6E
SEA LANCE
A-6F

Of 35 recorded pieces of correspondence on TEMPs, 15 were approvals and 20 were comments or recommended changes. Overall, on a program-by-program basis, we have begun to see marked improvement in TEMP quality.

OT&E test plans were reviewed for over 11 programs, including:

GLCM
LANTIRN
AHIP
ALQ-131 Blocks II
M1E1 Service Ammunition
CV Inter-zone ASW Helicopter
Army RPV
Air-to-Air STINGER
MK-50 Torpedo
MK-48 Torpedo
JTIDS

Of 11 recorded actions dealing with test plans, 7 were approvals, 2 were approved with comments and 2 were returned with comments. Since OT&E-plan submissions follow TEMP review and, generally, extensive informal DOT&E discussions and reviews with the test community, this high percentage of final approval is to be expected.

We continue to apply Tom Peters' "management by walking around" (MBWA) principle, with over 170 trips taken during FY86 by representatives of the DOT&E office, including both the Director and our professional staff. Of these trips, more than 85% can be described as programmatic--test observation, test planning meetings, test resource planning meetings, test site or range review meetings, etc. The remainder involved non-program-specific conferences or speeches and presentations. Every visit confirms the wisdom of MBWA and the Congress in encouraging observers in the original DOT&E legislation. There is no substitute for first-hand, hands-on knowledge. Moreover, DOT&E visibility serves to reinforce the importance of OT&E.

External Affairs. A special subset of DOT&E travel and MBWA efforts is the Director's interface with various test-related industry and government functions and organizations and the news media. Clearly, hearing the message from the source promotes understanding and further confirms the sincerity and vigor of our effort. This past year the Director gave more than 20 speeches and presentations at various locations, including, the Defense Systems Management School, a Defense Week conference for industry, Mitre Corporation, the National Defense University, an AIAA conference, International Test and Evaluation Association conferences, the DoD Range Commander's Council, the Women in Defense Conference, the Armed Forces Communications and Electronics Association, Raytheon Corporation, and the 9th Annual Symposium on Survivability and Vulnerability. The Director also makes it a point to make himself available to the media, including Defense News, Air Force Magazine, Aviation Week, UPI, NBC, Aerospace Daily and others.

Perhaps the most important interface this office has is its continuing and open dialogue with the Congress. We have on record 15 separate pieces of correspondence to the Congress originated by this office. In addition, we have almost 20 visits and courtesy calls recorded and, of course, uncounted telephone contacts. Programs or issues involved in these contacts include BIGEYE, AMRAAM, BRADLEY, AEGIS, IR MAVERICK, DOT&E-related legislation and budget support testimony.

Facilities. Unfortunately, things are moving very slowly. The Director's office remains in room 3E318, with the staff dispersed in the same three locations noted in last year's report--1D731, 1A1063 and 3A336. The situation borders on the intolerable. The staff professionals' work areas are too small to permit meetings of more than two people (including the staff professional). Intra-office communication is severely hampered. The staff colocation (in the 1D700 area) action mentioned in last year's report as being scheduled for mid-1986 is now scheduled to occur by mid-1987, however, the first hammer has yet to be raised. The situation is not conducive to a smooth running office and, without a permanent location, our office automation system, including our test data base, cannot be brought on line.

Funding. In FY86 the DOT&E budget was reduced to \$7.95 million (O&M) from the originally authorized-appropriation level of \$10.65 million, primarily due to Gramm-Rudman-Hollings reductions. As a result, no new joint tests were initiated, and studies to refine requirements for an OT&E capability to simulate the air-land battle environment were deferred to FY87. The FY87 budget was approved by Congress at the \$11.3 million request level in the RDT&E (DOT&E) appropriation. Our funding in the RDT&E appropriation is now consistent with the focus of our efforts, IOT&E, which is funded from RDT&E, and is quite sufficient to the needs of the office.

Once again, the DOT&E participated in DoD budget (FY88-89) formulation activities. We were particularly successful this year, as the Department approved budget initiatives for OT&E capabilities improvements (FY87 supplemental plus an FY88-89 budget line) and space systems test capabilities (FY88-89 budget line). Both are described in some detail in the Resource-Management Initiatives section. The approval of these proposals marks a clear endorsement of the importance of T&E by the Department. While last year's budget initiatives were important, they pale by comparison to this year's. The DoD has recognized the substantial shortfall in OT&E capability (realism)

and has endorsed the need for test capabilities to support systems that will routinely operate in space or near-space. It appears that T&E may have turned the corner and is no longer the unpopular third cousin of acquisition.

Conclusion. FY86 has been an eventful year. It marks the beginning of a new vitality for T&E, which should translate into significantly improved combat effectiveness in our weapon systems and efficiencies in T&E. The DTEC, the FY88-89 budget initiatives, the organizational reviews completed and the consolidation currently being considered all bode well for the future effectiveness of T&E in the Department. Finally, the activities summarized above reflect a new objectivity and visibility that has not heretofore been present in T&E. We hope for it to continue.

PROGRAM OVERSIGHT

This office is responsible for approving the adequacy of plans for operational test and evaluation, and for reporting to the Secretary of Defense and the Congress the operational test results for all major defense acquisition programs. For DOT&E oversight purposes, major defense acquisition programs were defined in law to mean those programs meeting the criteria for reporting under Section 2432, Title 10, U.S. Code, Selected Acquisition Reports (SARs). Currently there are about 114 such programs. The law (§138(a)(2)(b)) also stipulates that the DOT&E may designate any other programs for the purpose of his oversight, review and reporting. With the addition of such "non-major" programs, the DOT&E currently is cognizant of 155 acquisition programs.

Non-major programs are selected for DOT&E oversight after careful consideration of the relative importance of the individual program and the workload of the responsible staff assistant. In selecting non-SAR systems for oversight, consideration is given to one or more of the following essential elements:

- o Congress or OSD agencies have expressed a high level of interest in the program.
- o Congress has directed that DOT&E assess or report on the program as a condition for progress or production.
- o GAO will monitor and/or report on operational testing.
- o The program requires joint or multi-Service testing (the law (§138(b)(4))) requires the DOT&E to coordinate "testing conducted jointly by more than one military department or defense agency").
- o The program exceeds or has the potential to exceed the dollar threshold definition of a major program according to DoDD 5000.1, but does not appear on the current SAR list (e.g., highly classified systems).
- o The program has a close relationship to or is a key component of a major program.
- o The program is one in which an existing system is undergoing major modification.
- o The program is in trouble or has a history of serious problems.
- o The Service operational testing agencies (OTAs) have specifically requested DOT&E involvement.
- o The system falls under Special Operations Forces (SOF) purview.

PROGRAMS UNDER DOT&E OVERSIGHT

A. Programs Meeting the Criteria of Section 2432, Title 10, U.S.C.

<u>ARMY</u>	<u>NAVY</u>	<u>AIR FORCE</u>
AAWS-H	A-6E/F	AIM-7M (SPARROW)
AAWS-M	AIM-7M (SPARROW)	ALCM (AGM-86B)
ADDS	AIM-54C (PHOENIX)	AMRAAM (AIM-120A)
AH-64 (AAH)	AMRAAM (AIM-120A)	ASAT
AHIP (OH-58D)	ASPJ (ALQ-165)	ATARS
ASAS	ASW SURVEILLANCE	ATF
ATACMS	AV-8B	B-1B
BRADLEY FVS (M2/M3)	BATTLESHIP REACTIVATION	C-5B
CH-47D	CG-47 (AEGIS)	C-17A
COPPERHEAD (CLGP) ₂	CIWS (PHALANX)	CELV
FAADS (incl FAADC ² I)	CM/H-53E	CENTAUR
HELLFIRE (AGM-141A)	CVN 71/72/73	COMP FIGHTER PROC
JTIDS	DDG-51 (AEGIS)	CIS (MARK XV IFF)
LHX	E-2C	CSRL
M1 TANK	E-6A	DMSP
MLRS	EA-6B	DSCS III
MLRS-TGW	F-14A/D	DSP
MSE	F/A-18	EJS
PATRIOT	FFG-7	F-15
PERSHING II	HARM (AGM-88A)	F-16
RPV	HARPOON	GLCM (BGM-109G)
SINCGARS	HFAJ	HARM (AGM-88A)
STINGER	JTIDS	IIR MAVERICK (AGM-65D)
TOW 2	LAMPS MK III	INEWS
UH-60A	LCAC	I-S/A AMPE
	LHD	IUS (SPACE SHUTTLE)
	LSD-41	JSTARS
	MK-48 ADCAP	JTIDS
	MK-50 TORPEDO (ALWT)	KC-10A
	NAVAL AIRSHIP	KC-135R
	P-3C	LANTIRN
	SEA LANCE (ASW SOW)	MLS
	SH-60F (CV HELO)	NAVSTAR GPS
	SQS-53C SONAR	OTH-B
	SSN-21	PEACEKEEPER
	SSN-688	PLSS
	STANDARD MISSILE (SM-2)	SFW
	SUBACS/FY 89 COMBAT SYS	SMALL MISSILE (ICBM)
	T-45TS	SRAM II
	TACTAS (SQR-19)	T-46A
	TAO FLEET OILER	TRI-TAC
	TOMAHAWK (BGM-109)	WIS
	TRIDENT II MISSILE	
	TRIDENT II SUBMARINE	
	V-22 (JVX)	

PROGRAMS UNDER DOT&E OVERSIGHT (CONT'D)

B. Programs Designated in Accordance with Section 138, Title 10, U.S.C.

ARMY

ATM
CHAPARRAL (RSS)
CIS (MK XV IFF)
DDN
FSVS/STU-III
HMMWV
I-S/A AMPE
JSTARS
JTACMS
LADS
LAV-25
MCS
MILSTAR
M88A1
M9 ACE
M939A2 5-TON TRUCK
M109A2 155MM (HIP)
NAVSTAR GPS
QUICK FIX
REGENCY NET
SADARM
SAW
SCOTT
STINGER MODS (RMP)
TACCS
TACJAM
TRI-TAC
WIS
9MM PER DEF WEAPON

NAVY

ATA
ATRS
BIGEYE (BLU-80B)
CIS (MK XV IFF)
DDN
ELF
FDS
FSVS/STU-III
ICNIA
IIR MAVERICK (AGM-65D)
INEWS
I-S/A AMPE
LINK 11 IMPROVEMENT
MILSTAR
NAVSTAR GPS
N-ROSS
OTH-R
RAM (RIM-116A)
REGENCY NET
S-3 WSIP
TRI-TAC
VERTICAL LAUNCH ASROC
WIS

AIR FORCE

ACM
AGM-130 (POWERED GBU-15)
ALQ-131 JAMMER
ASPJ (ALQ-165)
ATB
BIGEYE (BLU-80B)
CSOC
DDN
EF-III A (TJS)
E-3A
FSVS/STU-III
HH-60A
ICNIA
JTACMS
MILSTAR
MC-130H
PAVE PAWS
REGENCY NET
TAOC/MCE
V-22 (JVX)

PART II
POLICY AND RESOURCE-MANAGEMENT INITIATIVES

POLICY INITIATIVES

Introduction. In our FY85 Annual Report, we highlighted a number of policy initiatives and concerns, including, early OT&E, treatment of deficiencies, annual TEMP updates and a T&E symposium on policy and resource concerns. We will revisit each of these areas and, in addition, we will address several items that surfaced in FY86 which had significant policy implications--the DOT&E report on operational test and evaluation in the DoD, procurement T&E and the DoD Test and Evaluation Council (DTEC).

General. The purpose of operational test and evaluation is to determine the operational effectiveness and suitability of a weapon system in its intended operational environment throughout the system's life cycle. Traditionally, that portion of OT&E considered most important is the initial phase--IOT&E. IOT&E should begin with program inception, continue throughout the program and culminate with a final phase just prior to the decision to proceed beyond low-rate initial production (B-LRIP). IOT&E results can provide valuable insights to the developer, facilitating concept system fixes, and the intended user, facilitating employment of the system in its anticipated operating environment. Results are also used by decision makers at all levels of the Military Departments and the Office of the Secretary of Defense. The phases of OT&E and a new view of T&E in support of procurement will be treated in more detail in the procurement T&E section below.

Early OT&E. Policy tenets requiring the Services to initiate early OT&E activities were promulgated with the publication of the revised DoD Directive 5000.3, "Test and Evaluation," in March 1986. Although early OT&E is not a new policy, it was reemphasized, and reporting requirements were clarified. As mentioned in our FY85 Annual Report, the directive requires the Service operational test agencies to project the operational utility of competing system concepts and system alternatives in early OT&E assessments reported at Milestones I and II. In the main, however, implementation by the Services has been less than enthusiastic.

Prior to revision of DoDD 5000.3, the Army had initiated a continuous comprehensive evaluation (C²E) program intended to bring together an all-aspect (including operational) evaluation of a weapon system from cradle (start of development) to grave. The intent of the program is good. However, since it is still in its infancy the jury is still out on how well it works in practice. For example, although at this time the Army's OT&E agency (OTEA) is in charge of assembling all evaluation information including its own, authority and responsibility lines are not entirely clear (i.e., the OTEA commander, a major general, is placed in the position of having authority over Army four star generals) and the application and availability of C²E information is similarly unclear.

The Air Force OT&E agency (AFOTEC) has begun to examine its role and the role of OT&E early in the weapon development process. Currently, they have defined that role as one of planning to facilitate the conduct of the final phase of OT&E when hardware is available and a B-LRIP decision is pending. The assessment function (projecting operational utility), emphasized earlier, has not been taken up at this time, although it is being given serious consideration. On a related note, the Air Force has directed AFOTEC to brief OT&E results at all milestone reviews. Previously, AFOTEC was present at the reviews but the acquisition program manager briefed OT&E results.

For its part the Navy has not yet acted to implement early OT&E.

Concerns have been expressed by all Services that early OT&E assessments may be viewed as early (premature) "blessings" of a system at the other end of the spectrum, may be viewed as a final evaluation and used to terminate a program that has promise. Another frequently mentioned concern is the potential for compromise of the OTAs independence and objectivity, as they may be perceived as an advocate for particular concepts or system configurations. Nevertheless, we remain convinced that early OT&E and the resultant operational utility assessments will be valuable in maintaining the development process focus on operational effectiveness and suitability. The potential benefits far outweigh the pitfalls, which are manageable, and consequently, early OT&E will continue as a DOT&E point of emphasis. It should be noted the new view of T&E discussed in the Procurement T&E section will serve to facilitate early OT&E and mitigate some of the pitfalls.

Treatment of Deficiencies. The study cited in our FY85 Annual Report was completed and the results were not surprising. The study focused on the current DoD policy for the treatment of deficiencies found during test and evaluation of a weapon system under development and the implementation of that policy by the Services. A second phase review of detailed Service procedures is under consideration.

The study examined OSD and Service policies for the identification, description, reporting, review, resolution and criteria for closing out deficiency reports. Policy guidance in the Services ranged from very specific to very general, with all Services relying on both the developing agent and the OTA to report deficiencies. Generally, the developing agent is first on the scene with reports, since he is present from program inception. The OTA generally begins identifying deficiencies through the Service reporting system after Milestone II, well into full-scale development. The DoD directives which speak to deficiency reporting (DoD manual 4245.7M, "Transition from Development to Production"; DoDD 5000.3, "Test and Evaluation"; DoDD 5000.40, "Reliability and Maintainability"; Mil Standard 785B) all have consistent approaches to deficiency reporting, requiring a recurring reporting process, prioritization of deficiencies and the establishment of a failure review board. In general, it was found that existing policy at both OSD and Service levels is adequate as far as it goes, and there is not conflicting direction in place. However, DoD directives allow very liberal interpretation of the policy and, consequently, Service implementation varies somewhat and terminology is not standard.

The results indicate it is apparent that more attention should be given to the criteria and authority for closing out deficiencies. As it stands now, deficiencies, regardless of their significance, may be closed out by the program manager, and the process for appeal is either very cumbersome or not well defined. Also, there is not now any requirement to report the status of deficiencies to OSD or Service senior decision-making levels. We are currently considering options for the review of deficiencies at OSD levels for major defense acquisition programs. Once again, the procurement T&E approach discussed below may facilitate a solution to this area of concern.

Annual TEMP Updates. The requirement for annual TEMP updates was implemented with the publication of the revised DoDD 5000.3 in March 1986. The structure and content requirements for TEMPs were confirmed in detail with the publication of the TEMP manual (5000.3-M-1) in October. In coordination with the DUSD(A)(T&E), a tracking system for the regular review of the status of TEMPs has been developed. Schedules for the formulation of new TEMPs and the update of old, outdated TEMPs have been established and agreed to by the Services. After this initial update phase (most TEMPs are scheduled to have been updated by 15 December 1986), the TEMPs will be updated annually on their OSD-approval anniversaries. A tracking system will be maintained to insure continuing emphasis on TEMP currency. In addition, DoDD 5000.3 requires that TEMPs include a resource summary describing all resources (e.g., threat simulators, test ranges, test articles, flying hours, steaming hours) necessary to successfully prosecute a T&E (DT&E and OT&E) program. It also requires the identification of resource limitations and shortfalls. The initial submission of these summaries occurred on 15 December 1986 (the results are summarized in the Resource Overview). Resource summaries will be updated biennially with the Service POM submissions.

T&E Symposium. The T&E symposium was jointly sponsored by DOT&E and DUSD(A)(T&E) held on June 10-11, 1986 and was judged a useful communications tool. It provided a dialogue between and among the DT&E and OT&E communities at Service headquarters and OSD levels down to and including representatives of the major DoD test facilities and OT&E agencies. Senior-level panels were held to discuss a number of important policy and resource concerns, including: congressional/Packard Commission T&E initiatives; combined DT/OT and concurrency; early OT&E; prototyping; DoD directive 5000.3--TEMP requirements, T&E reporting requirements; multi-Service programs; Major Range and Test Facility Base management policy and long-range planning; electronic warfare threat simulation/architecture; and joint test and evaluation.

The resulting consensus was that three key areas needed attention. First was the need for earlier OT&E involvement to enhance the prospects of a favorable assessment at the B-LRIP decision point. The second key area was the current uniform funding (reimbursable) test facility management scheme prescribed by DoDD 3200.11. The first concern is consistent with our continuing emphasis on early OT&E. The second is more complicated and derives from a consensus that reimbursable funding neither breeds efficiency in operation nor facilitates investment in new test capabilities because it implies the bill must be paid by someone else, usually the users. A OSD-directed review will be initiated soon to examine T&E management and investment procedures in anticipation of an FY90-91 POM initiative to achieve efficiencies, improve facility management and identify new investment priorities. The last area of concern focuses on realism in testing in general and electronic warfare threat simulation for OT&E in particular. An approach to this problem was developed during the FY88-89 budget formulation process and was included in the supplemental (OT&E capability improvement) and will be addressed in the Resource-Management Initiatives section.

DOT&E Report. In April, the Secretary of Defense asked our office to examine the techniques, role and organization of OT&E in the DoD acquisition process, assess the adequacy of OT&E as currently organized, conducted and reported and make recommendations for improvement in light of the proposals of the President's Blue Ribbon Commission on Defense Management (Packard Commission). The report was completed to the Secretary on 24 September 1986. Its

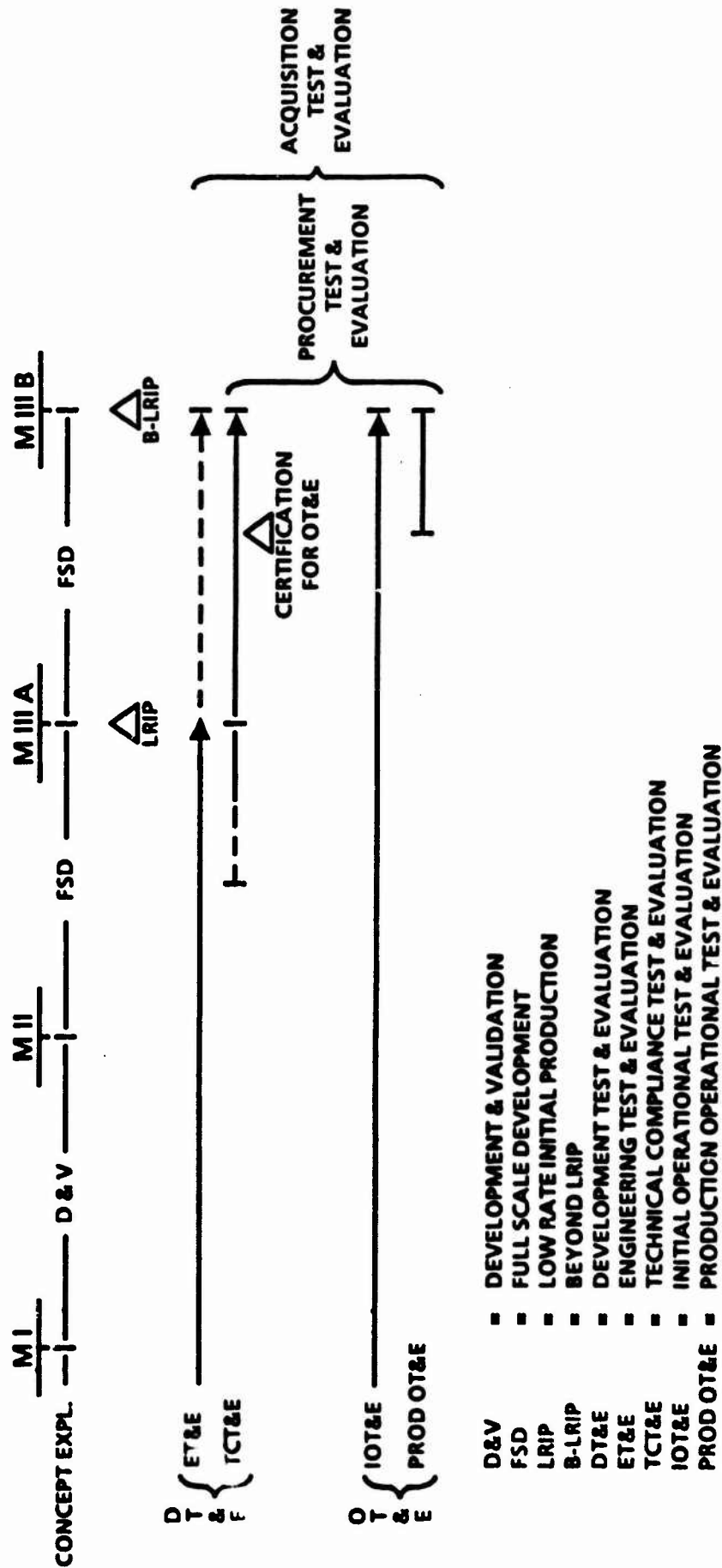
recommendations are keyed to the need for: 1) T&E in support of procurement to be focused on operational "Will it work?" questions; 2) responsibility and accountability for "enough testing," "enough realism," and independent, timely reporting of results to be clearly established both within the Services and OSD; and 3) realism, efficiency and productivity to be improved while reducing the overall cost of testing. The recommendations address five key areas: 1) the maintenance and enhancement of OT&E independence; 2) the consolidation of OSD-level OT&E management and oversight; 3) the financing of needed test and evaluation capabilities; 4) the facilitization of early and continuous OT&E; and 5) a refocus of the joint operational test program. (The executive summary of this report is included here as an appendix.)

Procurement T&E. This section describes a reorientation of test and evaluation activities, espoused by this office, currently under consideration within the Department. It involves both DT&E and OT&E and would facilitate a steady focus on the DoD goal of procurement of operationally effective and suitable weapons systems. Under this concept, no new test and evaluation activities are defined, rather existing T&E activities are collected under new labels and, ultimately, under a new organizational structure. This "regrouping" allows T&E to be used freely as a tool and an aid to the development process, as appropriate, and as a contract technical compliance and combat production readiness evaluator at the B-LRIP decision point. As depicted in the accompanying chart, all T&E supports acquisition, but by breaking T&E down into its logical components, it can be better focused on procurement of operationally effective and suitable weapons systems. The phases of acquisition and procurement T&E are shown in the chart.

DT&E. Engineering T&E (ET&E) is that component of DT&E conducted under the control of the program manager (developer) and contractor to determine the engineering maturity of the weapons system. ET&E will begin with program inception and will continue through FSD as a tool for the engineer to verify that technologies are being successfully engineered and integrated into the weapon system. As an engineering tool, ET&E is not evaluating systems against rigid standards or specifications and should not be exposed to public scrutiny or used to prejudge a weapon system's operational potential.

Technical Compliance T&E (TCT&E) is that component of DT&E conducted to prove that systems and subsystems of a weapon meet contractually defined technical performance specifications. TCT&E may be conducted as a single entity or may occur in phases as subsystems mature. TCT&E is that component of DT&E that must be performed in order for the developer to certify (as required by DoDD 5000.3) that the weapon system is ready for the final phase of OT&E--production OT&E.

OT&E. Initial OT&E (IOT&E) is that component of OT&E, initiated at program inception, conducted to forecast operational effectiveness and suitability. IOT&E should be viewed as a tool to provide insights about the potential combat worth of a weapon system throughout the development cycle. IOT&E may take advantage of any test results and may use simulation, modeling or paper analyses to develop assessments. It will not be conducted under the rigid rules specified in 10 U.S.C. 138 as it will be dealing with concepts, system alternatives and no or very immature hardware. IOT&E, however, will be reportable to the DOT&E so that an objective, independent assessment of development progress from an operational viewpoint will be available to both Service and OSD decision makers.



Test and Evaluation for System Acquisition

Production OT&E is that T&E that traditionally is thought of as OT&E. It is the "final exam" prior to a B-LRIP decision. It is intended that Production OT&E meet all the criteria established by the Congress in 10 U.S.C. 138 for OT&E, including prohibitions on contractor personnel participation in OT&E. Production OT&E would be conducted only after the developer has certified (as required by DoDD 5000.3) that the system is ready.

In order to insure focus and comprehensiveness in the Department's approach, those components of T&E grouped under the label "Procurement Test and Evaluation" (TCT&E, IOT&E, production OT&E) must be overseen by a single independent OSD-level authority for T&E. This authority would be independent of but would provide all information acquired on development programs to the USD(A) as well as to the Secretary of Defense. Only by doing this can we be assured that the unitary focus required of the developer and the independent operational tester--the translation of operational effectiveness and suitability criteria into operationally effective and suitable weapon systems through development to contract specifications to production--will be realized. It also will provide a more open atmosphere in which deficiencies can be discussed openly at senior Service and OSD levels without fear of jeopardizing the program. We strongly support procurement T&E and believe that it is the approach that will best serve the new acquisition management approaches advocated by the Packard Commission.

DoD Test and Evaluation Council (DTEC). Because of the significance of the test and evaluation issues brought before the Defense Resources Board (DRB) and the Deputy Secretary of Defense (DepSecDef) during the review of the FY88-89 budget, the DepSecDef directed that the DTEC be formed. He further directed that the DOT&E should chair the DTEC and that it should be institutionalized as a standing council. The initial business of the DTEC was the review of the two T&E budget issues brought before the DRB--OT&E capabilities improvement and space system test capabilities. (Both issues are discussed in the Resource-Management Initiatives section of this report.) Subsequently, a DoD directive was developed and is currently in coordination to formalize the council and its membership. As currently envisioned, the council will submit its findings and recommendations to the USD(A) and will include membership from DOT&E (chairman), USD(A), ASD(C3I), ASD(C), DPA&E, Army, Navy, Air Force, DARPA, DNA, NASA and such other offices or agencies as may be required for particular subjects. The purview of the DTEC will include T&E related resource matters (e.g., test capability investments) and management and policy issues (e.g., test policy reviews). Tasks may originate from the Secretary, the Deputy Secretary or any member of the DTEC. We support the DTEC and believe that it brings the high level, broad-based focus that is essential for T&E to turn the corner and provide the requisite evaluative capability needed for the 1990's and beyond.

RESOURCE-MANAGEMENT INITIATIVES

Introduction. In previous Annual Reports, we have provided background information on the creation of the Service independent OT&E agencies and the DoD and Service T&E resource management approaches. Since this information is historical and does not change, it is not included in the FY86 report. It is available upon request. In this year's report, we will address only those resource issues and initiatives that have surfaced during FY86.

In last year's Annual Report, we pointed out that it was increasingly important for OT&E to become involved in test facility/capability long-range planning in order to insure that test facilities essential to adequate testing would be available when needed. This would necessarily involve a T&E investment strategy that balanced foresight, efficiency, effectiveness and operational realism. Some of the avenues to be pursued were initiated during FY86.

Background. A number of background study efforts were undertaken or continued during FY86 to develop a better understanding of test capability requirements and potential efficiencies. The overall investment in systems that support T&E was reviewed and the aggregate estimate of the investment and operating cost of T&E activities was compiled on a year by year basis to allow some trend analysis. An approximation of the dollar value of T&E facilities was made and a preliminary study was conducted that estimated the effort necessary to establish new capabilities to support T&E requirements for certain new weapon systems which incorporate new technologies. As a result of these preliminary investigations, some new budget initiatives were created and a new oversight group, the DTEC was established to better develop and orchestrate T&E investment strategy. Each of the preliminary studies and the resulting initiatives are summarized below.

A number of measures were examined to help put the T&E picture in better perspective and to help address the question, "How much (testing) is enough?" T&E in the DoD has a budget of about \$4 billion a year and employs about 60,000 people (approximately one-half are contractor personnel). About one-third of the cost is funded by weapons acquisition programs that are served by T&E activities. Investment in new facilities has been averaging a little more than \$300 million a year. Excluding land, test aircraft and ships and expendable equipment, the real property value of test facilities in DoD is conservatively estimated to be in excess of \$22 billion. In spite of the magnitude of T&E resources, the annual amount spent to conduct T&E is less than 1.5% of the DoD budget. The annual investment in new T&E facilities is less than 0.2% of the DoD budget.

Adequate attention has not been given to T&E investment needs. The RDT&E and weapon systems procurement appropriations are indirect drivers of T&E activities. Over the past six years the DoD RDT&E and Weapons Systems procurement funding accounts have grown about 90%, and the investment in T&E facilities had insignificant real growth. T&E activities have had to rely increasingly on outdated facilities, which are expensive and are not adequate for many of the new systems. Our studies have shown that, at the time in the development cycle when technology has progressed to the point where it is being engineered into a weapon system and the program manager can establish a clear need for new test capability, it is frequently too late to initiate

acquisition of the new test capability. To make matters worse, much of the new test capability must be funded in the military construction appropriation, which has rules that serve as a deterrent to new T&E capability due to the difficulty in specifying upfront requirements for test capabilities needed to support systems at the leading edge of technology. Finally, at the recent rates of investment in new test capability, it would take more than 60 years to evolve from the current T&E facilities (\$22 billion worth) capable of testing older technologies to new facilities to support testing an entirely new set of technologies. This is clearly an unacceptable rate of investment. Such trend analyses point out that, if we are to achieve better testing, we must develop an investment strategy that will insure required T&E facilities are available when needed.

Furthermore, the magnitude of T&E operations and investment requirements coupled with the expected continuing competition for resources within the DoD budget dictate that management initiatives be explored to insure that the highest priority needs are identified and satisfied first, and that every possible efficiency is incorporated into T&E activities. As mentioned earlier, recognizing the need for increased management attention, the Defense Resources Board (DRB) established a new oversight and coordinating council, the DoD Test and Evaluation Council (DTEC). The DTEC is the vehicle to better incorporate T&E requirements into the existing Planning, Programming and Budgeting System (PPBS) system. Our target for full implementation of the DTEC long-range T&E planning initiatives is the FY90-91 budget submission.

In conjunction with its long range planning and integration emphasis, the DTEC will immediately initiate several efforts. These include initiatives 1) to identify all test facilities available to DoD (including those in the private sector), 2) to identify potential T&E cost efficiencies, 3) to look at possible alternative management structures for DoD test facilities and 4) to develop a set of DoD priorities for T&E investment. Progress has already been made in the FY88-89 budget process, as two key initiatives were reviewed by the DTEC--space system test capabilities and OT&E capability improvements. Separately, the DOT&E required the Services to provide TEMP test resource summaries for the first time and also completed the first phase of a review of Service OT&E target requirements and capabilities.

Space System Test Capabilities (SSTC). Existing test facilities were found to be inadequate for the new technologies associated with space systems currently under development such as kinetic and directed energy weapons, space surveillance systems, and hypersonic propulsion systems and materials that will enter full scale development in the late 1980s and 1990s. In fact, today's facilities are barely adequate to support the experimentation and feasibility demonstration phases for these technology programs. The DUSD(A)(T&E) and the DOT&E jointly conducted a study to identify these inadequacies, examining needs through the year 2010. The first-cut analysis by the test community identified requirements for an investment of approximately \$10 billion, most of that needed before FY97. After a rigorous analysis to eliminate duplication and items that were not clearly supporting space testing, the requirements were reduced to a total under \$7 billion. (Although this sum might seem on the surface to be extravagant, such a program would approximate the size of previous government investments in T&E facilities for jet propulsion and wind tunnels.) This program would require \$2.3 billion dollars during the Five Year Defense Program (FYDP) period FY88-92.

During the summer DoD program review, this \$2.3 billion requirement was presented to the DRB. Since we viewed the SSTC to be a truly national test requirement, we proposed that all weapon system RDT&E and procurement accounts to be assessed about 0.33% so that all potential users of test facilities would contribute to the cost of T&E facility upgrades. The DRB decided that the SSTC requirement and the funding methodologies needed further study and more input from the potential users. Consequently, the DTEC was tasked to review the SSTC. The DTEC reviewed the requirements with the Services and recommended funding the highest priority requirements, still in the \$1.5 billion range over the FYDP. The Deputy Secretary of Defense decided in December 1986 that the programs driving the need for space-related test facilities should, for the most part, fund them. Consequently, FY88-89 hypersonic test facility funding was directed to be absorbed by the National Aerospace Plane program, while the majority of the SSTC funding was directed to be absorbed by the SDI program. Although as mentioned previously, there is an outyear (FY90-92) "tail" to SSTC, that portion was left for reconsideration in the FY90-91 budget, based on studies conducted in the interim.

The approved program included in the FY88-92 FYDP will initiate studies and some capability modifications in FY88, with most capability, facility improvements beginning in FY89. The SSTC initiatives are summarized below, followed by a funding recap:

- o Nuclear effects test capabilities would be upgraded to improve scintillation, redout and photon simulation capability and to improve understanding of the vulnerabilities of key sensor, space-based communication and operational systems/subsystems to nuclear effects at the system level.

- o Propulsion test facilities would be upgraded to handle T&E for larger solid rocket motors and more explosive propellants (with the near term facility funded in the Air Force budget).

- o Hypersonic facilities would be upgraded, particularly hypersonic structures test facilities, to support testing of large-area structures, high-altitude vehicles and hypersonic aircraft components.

- o Computational/simulation facilities would be developed or upgraded to handle battle management artificial intelligence decision aids, intelligence integration algorithms, system loading, graceful degradation, human factors/engineering testing during development and, eventually, for testing of full-scale systems.

- o Control center, communications and data processing upgrades would be accomplished to provide adequate safety and control for multiple Kwajalein Missile Range and off-atoll launch, tracking and command destruct capability; to improve data merging; and to handle increased data rates.

- o Target system requirements would be studied for SDI-type weapon systems, which present new problems because of the multiple targetting phases that may be involved (boost, post-boost, transition, etc).

o An advanced aerospace vehicle (ground support) facility is necessary to support test and preflight preparation of hypersonic and transatmospheric vehicles in a controlled environment.

o Electronic combat capability would be upgraded/expanded to provide a real-time simulation capability for space system components and battle management systems in a secure, controlled electromagnetic environment and in transatmospheric regimes to provide a realistic survivability analysis capability.

o Sensor test facilities would be developed and improved to provide sensor focal plane array test capabilities for new larger aperture sensors with both space and earth backgrounds.

o Weapons effects facilities would be developed for kinetic (chemical and electromagnetic) and directed energy weapons, particularly as regards survivability and lethality evaluations.

o Tracking/telemetry upgrades would be accomplished to support the new capabilities being matured by the SDI, hypersonic and "stealth" programs. Vehicles are faster, smaller and less detectable than ever before. Gaps in coverage must be filled because of the high speeds involved, and beacons/positioning systems (GPS) must be miniaturized.

o A space guidance test facility would be developed to evaluate the higher accuracies required of guidance systems. Because of the accuracies needed, the facility must also be seismically isolated (currently unfunded, originally included in the SDI program).

o A space range capability, which combines exo- and endoatmospheric requirements, will be defined to support testing of full systems as well as orbital subsystems that cannot be fully evaluated in terrestrial simulation chambers (e.g., orbital directed or kinetic energy weapons). Such a range would include orbital experimentation platforms, tracking and sensor platforms, data relay satellites and control systems.

o Full-system environment/sensor chamber requirements would be defined because of the tremendous expense of on orbit testing. Although such a chamber or network of chambers will not be inexpensive (\$500 million), its cost would be amortized by the cost of a very few space launches. It is essential to be able to get as close as possible to the real environment (with simulated targets) and full-system testing on the ground before we embark on the expense and risk of orbital testing.

The above is just a brief overview of the requirements that have surfaced. The FY86 effort represents a first-order requirements collection. During FY87 further review will continue in order to surface those requirements which have not been identified yet and to formalize an architecture for what has been identified to insure continued harmony with the technologies driving the needs. The FY88-89 budget will support discrete facility/capability definition work. We intend to develop an acquisition approach in FY87 that will insure that test requirements can be met at an acceptable cost and risk. With this

(FY88-89) funding, the DoD is providing needed facility investment. The funding also marks a new, focused management approach to insure that DoD funds are used efficiently to provide the highest priority requirements for all the Services--a DoD-wide capability. SSTC funding is recaped below.

SSTC FUNDING RECAP
(\$ MILLIONS)

	<u>88</u>	<u>89</u>	<u>90</u>	<u>91</u>	<u>92</u>	<u>FYDP TOTAL</u>
Nuclear Effects	12	19	12	14	24	81
Propulsion Test Facilities (In Air Force Budget)						
Hypersonic /Structures Fac*	30	11	26	40	15	122
Computational/Simulation Fac	0	0	14	14	5	33
Control Ctr/Com/Data Process	0	18	30	9	0	57
Target Systems	2	2	4	5	12	25
Advanced Aerospace Vehicle	0	0	8	35	59	102
Electronic Combat Capability	0	0	12	17	22	51
Sensor Test Facilities	16	21	25	6	7	75
Weapons Effects Facilities	5	31	109	138	82	365
Tracking/Telemetry Upgrades	11	57	42	69	98	277
Space Guidance Test Facilities (Reserved)						
Space Range Capability**	2	12	41	57	110	222
Full System Environmental						
Sensor Chamber	<u>2</u>	<u>5</u>	<u>10</u>	<u>21</u>	<u>42</u>	<u>80</u>
Total for All Projects	<u>80</u>	<u>176</u>	<u>333</u>	<u>425</u>	<u>476</u>	<u>1,490</u>

* Funded in the NASP program. Remainder of the SSTC is funded in the SDI program.

** \$2 million, FY88, and \$5 million, FY89, is requested for an OSD PE (64941D) to oversee SSTC study efforts.

Note: FY90-92 requirements will be viewed again as part of the FY90-91 budget and are shown here only to indicate the magnitude of the total requirement.

OT&E Capabilities Improvement (OCI). Another review undertaken this past year was a look at deficiencies in OT&E capabilities. The result was an FY87 supplemental budget item and a line in the FY88-89 budget.

DOT&E reviewed the program the Services submitted for FY88-92 in May 1986 and determined that there were serious OT&E capability shortfalls. It was determined that these shortfalls would preclude many current and future OT&E's on systems operating in the air-land battle environment from being adequate and meaningful. Furthermore, the only Service initiatives in sight would not be considered until the FY90-91 budget. DOT&E's analysis indicated that funding should be incorporated into FY87 if at all possible and certainly not later than the FY88-92 FYDP.

These inadequacies were brought to the DRB for resolution and, like the SSTC issue, were turned over to the DTEC for review. The DTEC's final study was completed in time to be considered for the FY87 supplemental budget submission as well as the FY88-89 budget. The Deputy Secretary of Defense concluded that these improvements were valid and should be funded. The need

was so compelling that it was determined that the OCI should be started as soon as possible. Consequently, it was included in the FY87 supplemental request.

By in large, OT&E is conducted using facilities designed for DT&E or training. Consequently, there are significant limitations in test realism (threats, representative terrain and weather, accurate force-on-force instrumentation, integration of red and blue forces, valid end-game solutions, survivability determination). The OCI program will be the core of an effort to develop a largely mobile field testing OT&E capability that will enable the testing of weapons systems in a realistic air-land battle scenario. Also included in the overall program is funding for Army helicopter surrogates, Navy deep-fast underwater target development and GPS-based (fixed) test range instrumentation. All were included in the FY87 supplemental and continued in the FY88-89 budget request. Programs that will benefit from the OT&E capabilities (initial capability projected for 1990) include LHX, ATA, V-22, ATB, Follow-on CAS, FAADS (helicopter surrogates), Mk-48 and Mk-50 torpedos (underwater target) and most current weapons systems.

The program will be coordinated and overseen by the DOT&E and will be executed on a competitive basis among the Services and private industry. That is, competitive proposals will be sought from all interested parties, as appropriate, and the Service and/or private sector company with the best idea will execute that portion of the investment profile. A summary of the funding for the overall OT&E capabilities improvement issue, as approved in the FY87 supplemental and FY88-89 budget is provided below.

OT&E CAPABILITIES RECAP
(\$ MILLIONS)

	<u>FY87</u>	<u>FY88</u>	<u>FY89</u>	<u>FY90</u>	<u>FY91</u>	<u>FY92</u>
OT&E Capabilities Improvement (PE 64340D)						
	46	93	138	*	*	*
Instrumentation	(4)	(23)	(25)			
Threat Simulators	(39)	(66)	(93)			
Infrastructure	--	--	--			
Management	(3)	(4)	(3)			
Army Helicopter Surrogates (PE 65609A)	34	34	20	22	2	13
Navy Underwater Targets (PE 63529N)	10	10	15	25	--	--
GPS-based Range Inst (PE 64340D)	30	30.1	35.9	38.2	43.1	17.8

* FY90-92 requirements will be revisited in the FY90-91 budget review.

Note: The OT&E Capabilities Improvement and GPS-based (fixed) test range instrumentation are managed in OSD by DOT&E and DUSD(A)(T&E), respectively, through OSD PEs. DOT&E is coordinating the Army and Navy programs.

OT&E Target Study. The DOT&E study of aerial, surface and subsurface targets announced in last year's Annual report, identified a number of shortfalls in target availability and technology that may have significant impact on the testing of many future weapon systems. The study attributes these shortfalls to deficiencies in the management of targets that prevent the Services from developing and producing the quality and quantity of targets that are required for weapon system test and evaluation. These deficiencies include the lack of long-range planning that is needed to identify target requirements early enough for development and production and the often low priority accorded targets by the Services, which results in target funds being used for other projects.

Management Deficiencies. Service long-range test planners do not identify target requirements early enough for new target development and production. For example, systems such as the Forward Area Air Defense Systems (FAADS) and LHX require a low-altitude/high-performance attack aircraft-type target, yet this requirement has not yet been adequately articulated by the Army. Targets for new systems such as the ATA and ATF should be under development now to ensure their availability for testing. However, specific targets required for a weapon system test are often not considered until preparation of the actual test plan begins (approximately a year before the test). At that late date, the tester has no option but to request existing targets, which are often not representative of the threat that the weapon is expected to encounter.

The study identified other management deficiencies: 1) Targets for testing are often given a relatively low priority within Service budgets in comparison to the priority accorded weapon systems. Hence, funds that could be programmed for targets may go for weapons development. 2) Inadequate planning and management lead to target inventory levels that are either over-filled or short, resulting in "feast or famine" situations. Although targets are sometimes loaned by one Service to another, when one has an overage, this is the exception and not the rule. 3) Although the Joint Technical Coordinating Group on Aerial Targets (chartered by the Joint Logistics Commanders) has accomplished a great deal towards standardization, pooling of targets and elimination of duplicative target development, the target development efforts of the Services continue to overlap. For instance, both the Army and the Navy are developing similar subscale subsonic targets. In addition, both the Navy and the Air Force are droning at least four different types of full-scale aircraft as targets, while the Army is developing a new full-scale target. All three Services are developing target augmentation systems.

Target Shortfalls and Deficiencies. The aforementioned practices have contributed to many target shortfalls and deficiencies, some of which are discussed below.

The operational testing requirements for the Forward Area Air Defense System (FAADS) have created an increased demand for both fixed and rotary wing targets. This problem, along with droning systems that do not provide adequate flight control, will result in aerial targets that do not adequately replicate the threat. Targets required for FAADS testing include full-scale helicopters and low altitude, high performance ground attack aircraft. Current droning systems for targets are rudimentary and preclude helicopters and high performance full-scale fixed wing targets from operating at a low altitude to replicate the enemy HIND/HAVOC/HOKUM helicopters and FROGFOOT attack aircraft

threats. The recent budget initiative to acquire helicopter surrogates may mitigate some of the helicopter shortfall. However, the surrogates are electronic, IR and RF flying (manned) threat simulators, not expendable, targets. The Army has awarded a minimally funded contract to improve helicopter drone control, but expensive, state-of-the-art technology will be required to achieve the realistic low-altitude maneuvers such as hover and low-level and nap-of-the-earth flight needed to adequately test FAADS, LHX and other future weapon systems.

The DOT&E has expressed concern over the continued lack of planning for future full-scale targets, an issue raised in last year's Annual Report. Subscale targets are often used as alternatives to full-scale targets, but they cannot always be adequately augmented to represent the threat. Concerned over the high costs associated with purchasing full-scale targets and the lack of a follow-on to current full-scale droning programs, the Army has embarked on the development of the Large Scale Winged Target (LSWT), a replica of the MiG-27 (Flogger-D). The production cost of each LSWT is estimated to be between \$350,000 and \$500,000. (This program may point the way to future target and surrogate threat aircraft developments.)

All three Services have weapons designed to counter the enemy high performance (Mach 3 at 80,000 feet) threat. The Navy is developing the AQM-37C (EP) to simulate this threat. This is the only high-speed/high-altitude target currently in production. The Army still has a need to successfully demonstrate PATRIOT performance in this speed/altitude range, and the Air Force has a requirement for these targets for the AMRAAM IOT&E and FOT&E. In the coming year, the DOT&E will study and determine the DoD high-speed/high-altitude target needs based upon probable weapon system threat engagement profiles against the expected high-speed/high-altitude threat. That is, what part of the total threat envelope needs target presentations, or "How much (target) is enough?"

Interservice sharing of targets is currently restricted because of incompatibility of range control systems at the six Service land/sea ranges. There is a need for a common control interface system that will allow interoperability between the range drone command systems and most of the targets. The Navy, working under Joint Technical Coordinating Group auspices, is developing an interface system using the MIL-STD-1533 data bus and translators to overcome the range/target incompatibility problems. This effort has the support of all the Services, but is not adequately funded.

Target Study Recommendations. The recommendations resulting from this first phase of the target study are generally consistent with previously mentioned resource management initiatives of the DOT&E. For example, target planning must be factored into the overall long-range planning initiative of the DOT&E. Also, central (OSD) control of target development funding will be given serious consideration and, at a minimum, target development activities must be completely coordinated and the lead agent assignments of the JTCC should be more strictly enforced and any confusion removed. Finally, we will undertake the second phase of the target study to 1) examine alternatives to target requirements (e.g., surrogates, captive carry testing against live targets, etc.) and 2) determine and focus on those portions of performance envelopes where we are most likely to engage the enemy and, consequently, not waste scarce resources on unnecessary edge-of-the-envelope excursions.

TEMP Resource Summaries. DoD manual 5000.3-M-1, "Test and Evaluation Master Plan (TEMP) Guidelines," requires the Services to "provide a summary of all key resources, both government and contractor planned, to be used during the course of the acquisition program." During FY86, the DOT&E and DUSD(A)(T&E) jointly pursued an aggressive program to bring all TEMPs up to date. As part of this effort, we asked the Services to provide the resource summaries required by the TEMP manual. The majority of the TEMPs were to be available 15 December 1986 and so the same suspense was placed on the resource summaries. Although resource information has always been included in TEMPs, this is the first time updated summaries have been requested. As with TEMPs themselves, compliance with content guidelines has not been enforced well in the past.

Since the summaries were not received until December 1986, we have only had time to do a quality and completeness check. Nevertheless, the result are encouraging. Of the total universe of reportable (continuing OT&E activity or mature enough to have a TEMP) programs, only four were not received. A total of 132 test resource summaries were reported. The data content varied significantly from program to program and from Service to Service, but it was better than anticipated. Key data elements requested included program milestones, test articles, test sites and instrumentation, threat systems, targets, operational force support, simulators, models, any special requirements and funding. These data were requested for the entire test program period ("cradle to grave") for both DT&E and OT&E testing and the data was to reflect any and all shortfalls. The variances in quality and completeness are summarized below by Service.

The Army's submissions (32) showed a uniformity that indicated careful review. However, only 34% of the submissions were completed--DT&E, OT&E and program milestone data. Resource shortfalls were shown on a summary page rather than on a program-by-program basis as requested. Also, none of the summaries were submitted as Part V of the TEMP (the resource summary section), indicating resource summaries had not been prepared on a routine basis as required. Other key data elements including test articles, threat systems and targets were not complete on a number of programs. On the positive side, entries were made for all data elements somewhere in the submission, indicating that the data is available or can be generated.

The Navy submissions (52) came from four different commands--Naval Air Systems, Space and Naval Warfare Systems, Naval Electronic Systems and Naval Sea Systems. The submissions were not uniform, and the quality varied substantially from command to command. With the independent command structure of the Navy, we anticipate this will be a continuing problem. Only 19% of the Navy submissions were complete--DT&E, OT&E and program milestone data. Resource shortfalls were shown for only two of the 52 programs. The Navy did submit some Part V TEMP resource summaries, indicating that in a few cases, routine resource planning is accomplished. However, this was the exception as only 19 of 52 programs were Part V submissions. Again, key data elements (threat systems, targets, test articles) were incomplete or ambiguous. As with the Army input, every data element was covered somewhere in the submission.

The Air Force submitted summaries for 48 programs, over half of which indicated shortfalls (unfunded requirements). Also, more than 90% of the submissions were complete with regard to DT&E, OT&E and program milestone data. Coordination was lacking, as there were some programs with DT&E data and no OT&E data and vice versa. Only two of the submissions were TEMP Part V, indicating a one-time effort. Once again, coverage was not complete for key data elements (test articles, threat systems, targets). All data elements had entries in the submission, and the resource shortfalls, with one exception, were in OT&E.

As a first attempt, the submissions are encouraging. The data is available or can be generated. However, the clear lack of a routine planning process for both DT&E and OT&E is a matter of concern. We will provide a critique to the Services and will require at least a biennial update coincident with Service Program Objective Memorandum (POM) submissions.

We are convinced that the effort consumed to develop TEMP resource summaries is valuable. It will be a catalyst to energize a responsive planning system for test resources and will provide an excellent tool to determine test program changes as original and updated submissions are compared.

DOT&E Threat Support Data Base. DOT&E is presently developing a threat support data base, using commercial, PC compatible software. The objective of the Threat Support/Long Range Planning System is to support fielding of high quality cost effective weapons systems by providing a means of insuring that these systems are operationally tested as realistically as possible to replicate those conditions under which the weapon system must be able to fight, win and survive on the battlefield. The data base will provide us with an updated account of major program test dates, threats to these programs, threat simulator requirements, shortfalls and resource requirements for threat simulators under development.

Background. Threat simulator assets are widely distributed among DoD activities nationwide. DOT&E oversight of threat simulator needs for testing has been extremely difficult due to a lack of central responsibility for these critical test resources. Collecting and maintaining a common base of information on threat simulator support for testing is crucial for complete DOT&E oversight and assurance of realistic operational testing.

Current Situation. Development of the data base is currently under way. Relatively extensive data are already in place for Army programs, and these will be refined and updated as work on the data base progresses. At the present time, data on Air Force and Navy/Marine Corps programs are limited primarily to data on Red threats to Blue systems/programs. Further data on Navy and Marine Corps programs are scheduled to be incorporated not later than the end of this year. The Navy's COMOPTEVFOR is providing valuable assistance by gathering information on Navy programs and will provide this to us in the near future. Data on Air Force programs are also being gathered at this time and will be incorporated as soon as possible. The target date for incorporation of much of this data is the end of calendar year 1987.

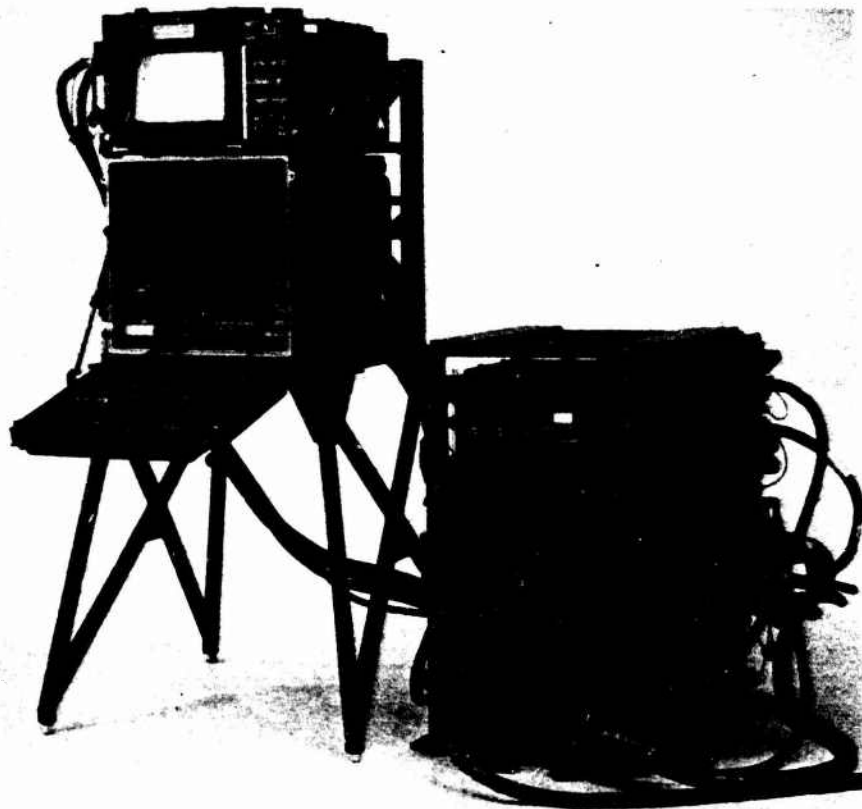
Benefits. This effort will provide DOT&E and the Services with a "big picture" of threat simulator support for operational testing. Through the

rapid identification of major programs affected by simulator shortfalls, impact statements can be developed which are traceable to hard requirements. This information will enhance DOT&E's participation and influence in the review and approval process for Service advanced threat simulator program/budget submissions.

Summary. Centralized information flow of threat simulator requirements and shortfalls is fundamental for DOT&E to maintain oversight of major program operational testing. The threat support data base being developed is a cost-effective and efficient method of achieving this, and Service assistance in updating their inputs will ensure the continued success of this program.

PART III
ARMY OT&E

MANEUVER CONTROL SYSTEM (MCS)



SYSTEM DESCRIPTION

The Army Maneuver Control System (MCS) is not a major acquisition program but was designated for oversight in accordance with Section 138, Title 10. MCS is an automated command and control system to aid in the effective employment and operational control of the tactical maneuver force, as part of the SIGMA overall Force Level and Maneuver Control system. MCS is a blend of military and what the Army calls non-development item (NDI) computer equipment to assist the staff element charged with conducting operations (G3/S3) for maneuver control. It is planned for echelons from maneuver battalion through corps to have such assistance in the form of the MCS computer network. Militarized computers and peripheral devices are to occupy critical or severe modes within the system while NDI computers and peripheral equipment are considered for less critical stations. Ada language software programs are planned.

BACKGROUND

Two sets of military hardware have been developed to occupy the critical, or severe, modes. The AN/UYQ-19 tactical computer system (TCS) was developed for corps, division and brigade. Battalions, not needing as much capacity, were planned to operate the AN/UYQ-30 tactical computer terminal (TCT). The TCT uses many of the same peripheral devices as the TCS, the principal difference being the TCT use of a floppy disk, instead of a magnetic tape recorder-reproducer, and a reduced quantity of communications channels. One feature of both is the plasma panel behind which a map can be inserted. Using appropriate software, Army tactical symbols can be superimposed on the map and moved with cursor and joystick controls. NDI equipments include the commercial AN/UYQ-43(V)1 Tactical Computer Processor (TCP), to function as a TCT surrogate, and the AN/UYQ-43(V)2 analyst console (AC). MCS provides capabilities for data entry, data base management, calculation, message writing and editing, filing, display with printout and automated communication of digital traffic over standard Army tactical communications systems.

OT&E ISSUES

The MCS has passed through various systems engineering phases since the TCS/TCT, beginning about 1975. In 1979, when the Tactical Operational System (TOS) program was terminated, these two devices were selected to support MCS and were deployed to VII Corps for field experience and feedback in lieu of traditional operational test and evaluation. In 1983, the Army approved full production of the TCS/TCT and initiated the NDI effort to emulate the TCT. In 1984, a TCP was selected for this application. In 1986, production of the TCS was terminated, and some TCT memory devices were replaced with the TCS type devices to create TCS replacements called TCT prime (TCT'). Also, Army made decisions to change the TCP microprocessor from 16 to 32 bit and proposed additions of the AC and Battalion Terminal (BT) versions of NDI. MCS awaits a Congressional production funding decision for NDI. The General Accounting Office (GAO) has prepared a fact sheet for congressional requesters and finds a need for formal operational testing prior to production. A test and evaluation master plan (TEMP) and an operational test plan are expected for DOT&E approval of operational testing for this designated program. Appropriate management attention must be provided to determine through OT&E the extent to which MCS can effectively and suitably be used with standard Army tactical communications systems for Army operations and maneuver control.

OT&E ACTIVITY

The Army Training and Doctrine Command Combined Arms Test Activity (TCATA) conducted an operational assessment (OA) of the TCP's ability to emulate the operational functions of the TCT. An independent assessment of the OA was initiated by the U.S. Army Operational Test and Evaluation Activity (OTEA). OA was conducted during a one week exercise at Fort Carson, Colorado, ending in August 1986. A TCATA report was issued in September 1986, but the OTEA letter assessment report is expected to be published in December 1986.

OT&E ASSESSMENT

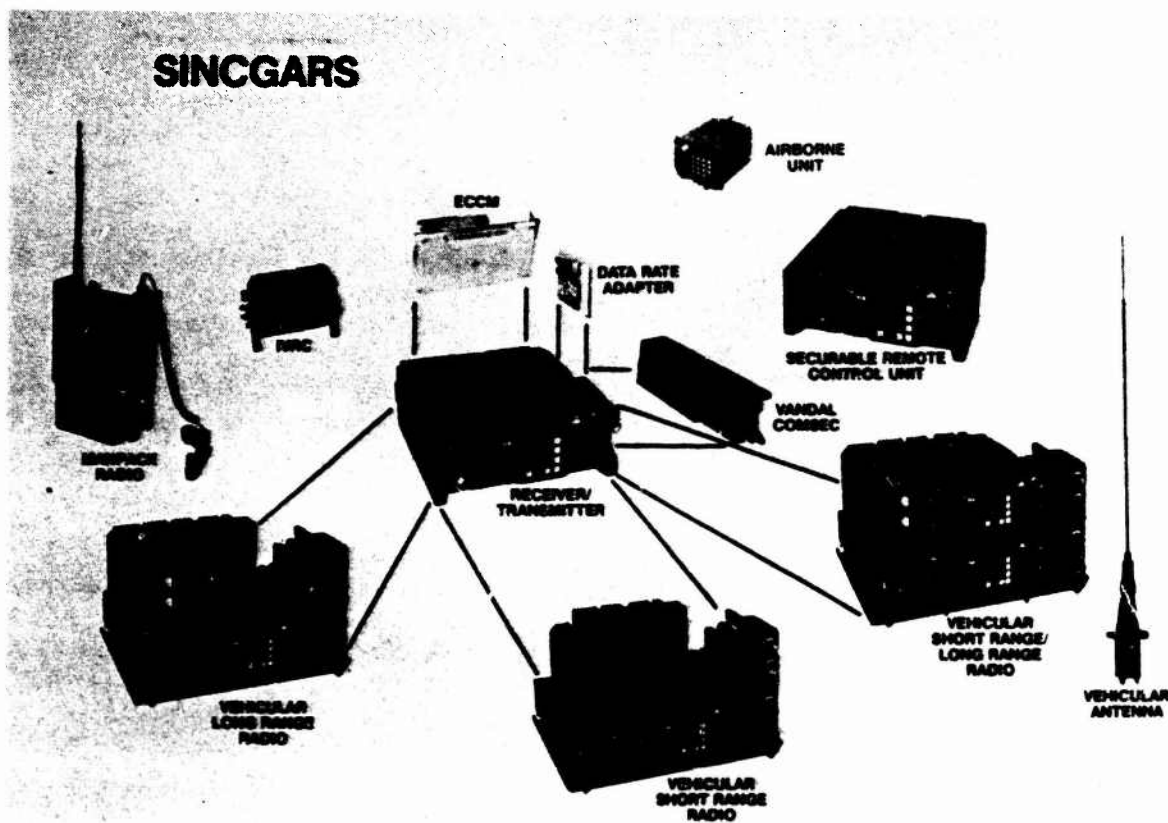
OT&E appears to have been structured to influence MCS fielding decisions as compared to MCS procurement decisions. Procurement of TCS and TCT is under-

stood to be complete with fielding decisions awaiting results of a follow-on OT&E in FY87. Procurement of TCP and other NDI is understood to be structured in a total procurement option contract, with follow-on OT&E to influence fielding decisions but not procurement decisions. The OA was conducted to support NDI procurement decisions. It demonstrated that the TCP has the potential to emulate the TCT, but raised several issues with respect to training, communications system interface and software maturity, which require further investigation. A TEMP and an OT&E plan have not been approved for the various MCS phases of testing and related program decisions. A DOT&E beyond low-rate initial production (LRIP) report to the Secretary of Defense and the Congress is required before the final Army decision to proceed with full-rate procurements of MCS equipment. This report will be in addition to others which have been requested from the Army by the Congress.

SUMMARY

There is a need for formal MCS operational testing to support procurement decisions. A TEMP and an OT&E plan are needed for the OT&E which should be completed, and formal OT&E reports should be assessed to support the DOT&E LRIP report and final Army decisions to proceed with full-rate procurement of MCS equipments.

SINGLE CHANNEL GROUND AND AIRBORNE RADIO SYSTEMS (SINGARS)



SYSTEM DESCRIPTION

The Army Single Channel Ground and Airborne Radio System (SINGARS) is a major acquisition program in the low-rate initial production (LRIP) phase. SINGARS is a VHF-FM combat net radio communications system to provide the primary means of command and control for infantry, artillery, and armor units critical to the conduct of land battle. The SINGARS family of radios is capable of transmitting voice, tactical data, and record traffic which meets NATO interoperability requirements in the single channel mode. Different versions are available to replace the current AN/VRC-12 family standard vehicular radios and the AN/PRC-77 manpack radio series, and includes the development of an airborne radio to replace the AN/ARC-S4/131, AN/ARC-114 and AN/ARC-186 (FM only) radios in Army aircraft.

BACKGROUND

A limited operational test (LOT) was first conducted by the U.S. Army Operational Test and Evaluation Agency (OTEA) using four advanced development model SINCGARS radios from each contractor at Fort Riley, Kansas, in November 1982. These test results were used to support the Army decision to accelerate from advanced development to selection of a production design in an attempt to provide a 1985 initial operational capability (IOC). A maturity operational test (MOT) was conducted at Fort Riley from October through December 1983 by OTEA to provide information to validate the Army production decision. Operational personnel from the 1st Infantry Division used 21 advanced developmental model radios to generate test data. Additional data were gathered from emerging results of development tests at Fort Huachuca, Arizona, and a human factors report by the Army Research Institute. An operational assessment (OA) test was conducted from August through September 1984 at Fort Huachuca, using contractor modified advanced development model radios to verify contractor solutions to major problems which surfaced during the MOT.

OT&E ISSUES

Army was advised by the Office of the Secretary of Defense (OSD) in December 1984 that a comprehensive follow-on evaluation of production radios was required prior to the planned award of contract Option III, which was then defined to constitute proceeding beyond low-rate initial production (LRIP). The Army was also directed to discontinue multi-year procurement plans and to submit a test and evaluation master plan (TEMP) to OSD for approval, including reliability and built-in-test thresholds. The SINCGARS contractor has not passed reliability tests on preproduction radios as required by the Army prior to delivery of the radios for the follow-on evaluation (FOE). This delay in completion of tests has resulted in loss of procurement funds in the FY86 and FY87 budget processes and the Secretary of Defense certification of the need to continue the program. These problems resulted in an Army FY86 survey of other industry radios for comparison to the current SINCGARS using issues and criteria from the 22 May 1986 draft SINCGARS TEMP.

OT&E ACTIVITY

OTEA has previously documented test results of the SINCGARS operational LOT, MOT and OA conducted on advanced development model radios. OTEA is preparing a report on the FY86 survey of other industry radios as compared to the current SINCGARS radios.

OT&E ASSESSMENT

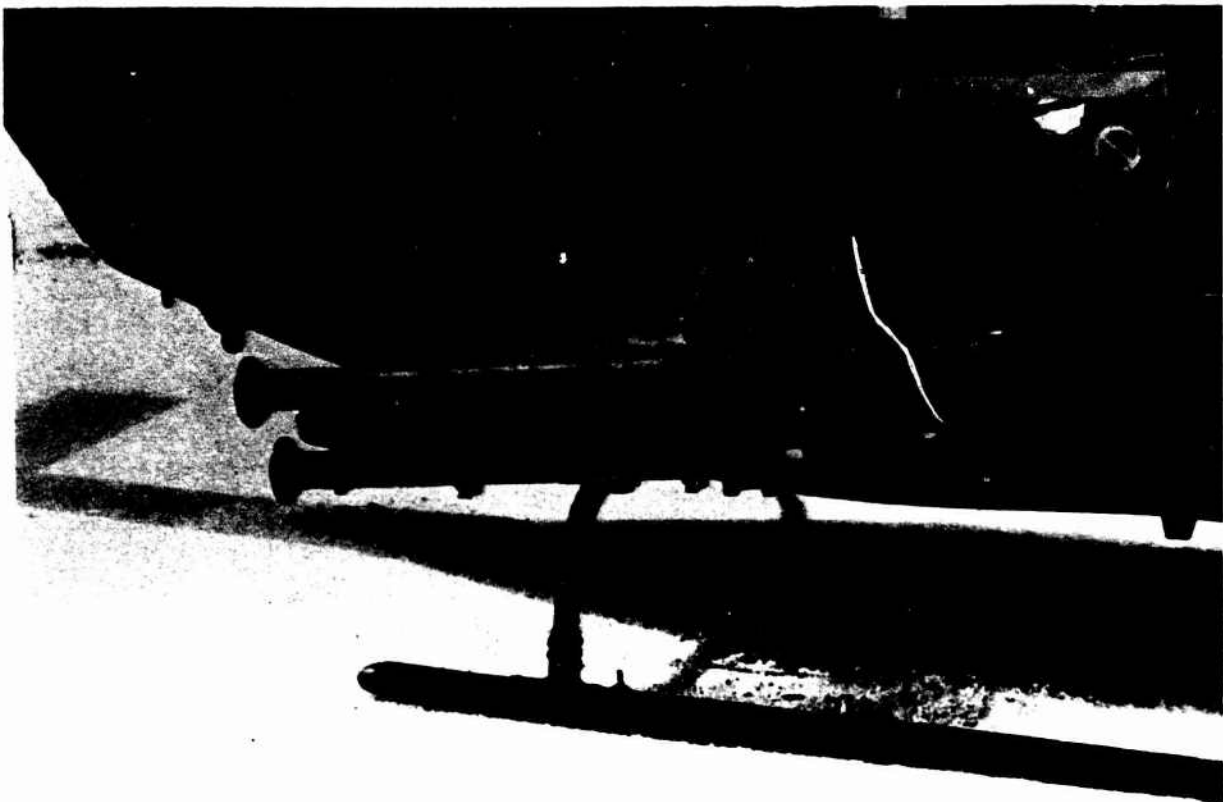
Redesign of the current SINCGARS appears likely to improve performance and producibility. The LOT, MOT and start of production were conducted before the establishment of DOT&E. The DOT&E assessment of SINCGARS is that operational testing has not confirmed that the system is either operationally effective or operationally suitable. Adequacy of the production design has not been proven with the LRIP units ordered since 1983. This LRIP design has not been proven adequate for either proceeding beyond LRIP or establishing a second source baseline.

The new airborne radio and integrated communications security redesign has not been subjected to operational tests. The FOE must be completed and an OTEA test report submitted to DOT&E prior to the decision to proceed beyond LRIP. These results will be the basis of a DOT&E LRIP report to Congress.

SUMMARY

The Army is still meeting with the contractor concerning SINCGARS performance and renegotiation of the procurement contract to deliver radios for FOE. The TEMP is being updated by the Army to reflect this revised schedule for conduct of FOE, submission of the OTEA test report and a final Army milestone decision to proceed with SINCGARS production.

AIR-TO-AIR STINGER



SYSTEM DESCRIPTION

The AIR-TO-AIR STINGER (ATAS) system will provide a simple-to-operate, fire-and-forget, defensive and offensive air-to-air combat capability for Army helicopters under varying environmental and threat conditions. The ATAS system will initially be deployed on the Army OH-58C and OH-58D helicopters, both flat- and rounded-canopy models, but will be adaptable to other launch platforms. The system consists of a missile subsystem, sight subsystem, aircraft modifications, and ground support equipment. The unmodified missile round is the same round issued to short-range air defense (SHORAD) unit personnel, and may be a BASIC STINGER, STINGER POST, or a STINGER RMP round.

BACKGROUND

The concept of using an existing missile to provide an air-to-air capability was successfully demonstrated in field tests with helicopters and STINGER Tracking Head Trainers during the joint countering of attack helicopters (J-CATCH) conducted in 1978 and 1979 and the 1981 self-protect air-to-air missile concept evaluation program (SAMCEP). The J-CATCH exercises demonstrated the capability of a helicopter-borne STINGER missile to acquire and track air targets. Two "engineering model" systems, consisting of launchers, interface electronics, control panels and interconnecting cables, were designed, fabricated and ground tested by General Dynamics, the manufacturer of the STINGER system. These systems were provided to the government for use in the Training and Doctrine Command (TRADOC) funded SAMCEP, which further demonstrated the system's capability to acquire and track helicopter targets flying at low altitude and in clutter. The SAMCEP exercise also demonstrated the ease of pilot training.

(U) OT&E ISSUES

The following major test issues were established by the Army for this test:

- 1) Can representative officer, NCO, and enlisted personnel perform critical operator, crew, tactical, and maintainer tasks to prescribed standards?
- 2) Does the ATAS system provide an effective antiaircraft capability?
- 3) Does the ATAS system affect scout helicopter deployability?
- 4) Does the ATAS system meet or exceed the specified reliability, availability and maintainability (RAM) requirements?
- 5) What is the RAM-driven ATAS system logistics burden on the operational unit?
- 6) Does the meantime to repair (MTTR) exceed the maximum allowable time specified in the user statement of required operational capability?
- 7) Can the ATAS system be maintained within the planned maintenance and logistics support structure?
- 8) Are logistics support materials adequate?
- 9) Is the ATAS system safe to operate and maintain?
- 10) Does the ATAS system meet human factors engineering design parameters?
- 11) Can user personnel attired in nuclear, biological, chemical defense equipment maintain and operate the system?
- 12) Can the system be decontaminated?

OT&E ACTIVITY

Test activity was conducted in three phases:

Phase I conducted at Fort Rucker, Alabama, in May and June 1986, trained pilots and maintainers in basic crew, operator and maintenance tasks.

Phase II conducted at Ft Bliss, Texas, in August and September 1986, focused on the assessment of various mission profiles, RAM requirements, logistical and maintenance structure, and decontamination. Target tracking and lock-on of simulated threat rotary- and fixed-wing aircraft were key elements of this phase.

Phase III, also conducted at Ft Bliss in August 1986, was a highly instrumented live firing of four missiles to assess target tracking by the pilot, missile trajectory, miss distance from the target and flight envelope data.

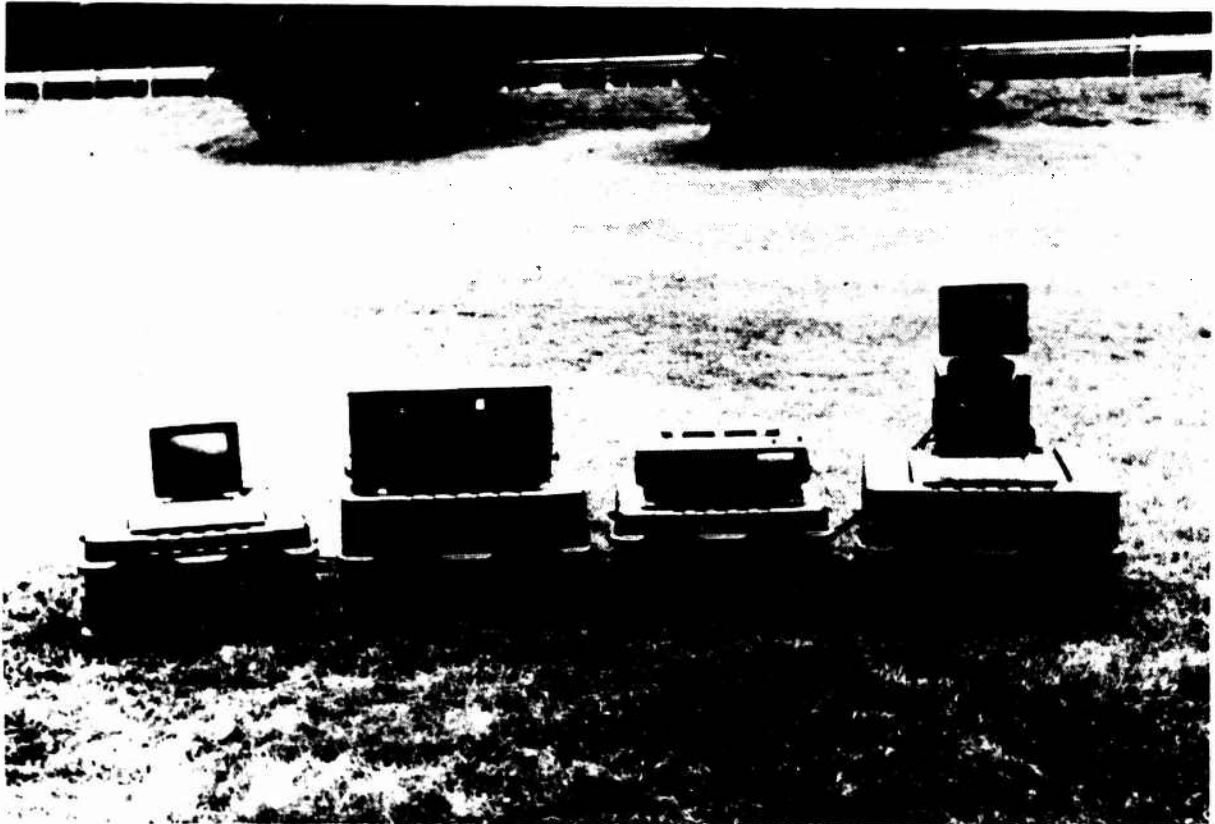
Phase IV, conducted at Ft Rucker in September 1986, used two ATAS equipped OH-58C helicopters to fly the profiles necessary to accumulate RAM data.

While the field trials have been completed, data analysis and report preparation are still under way.

OT&E ASSESSMENT

The test was adequate to validate the concept of air-to-air capability, however, a rigorous operational test under realistic battlefield conditions is required to assess operational effectiveness and suitability. Since this testing has been conducted using only BASIC STINGER missiles, testing with STINGER POST missiles will be required before a decision to enter production can be made.

TACCS



SYSTEM DESCRIPTION

The TACCS system is a militarized Burroughs Model 26 microcomputer which employs commercially available state-of-the-art technology. To enhance the systems operability in field environments, the components were consolidated into one chassis (master logic block) that is shock mounted in a ruggedized housing. The system is designed to operate in semi-controlled environments such as buildings, tents, and the interiors of tactical vehicles. TACCS will be used in two configurations, V1 and V2. The V1 configuration consists of the master logic block, visual display unit, keyboard and printer. The V2 configuration consists of a V1 plus a remote logic block, visual display unit and keyboard.

BACKGROUND

The TACCS is expected to provide data entry, inquiry, retrieval capability, editing, printing and data transmission, and is intended to replace the punched-card equipment now being used to support the administrative operations of Army divisions with respect to supply, maintenance, ammunition, transportation, medical and personnel. These functions require 11 separate and unique TACCS software programs and dedicated TACCS hardware.

OT&E ISSUES

The follow-on operational test addressed seven issues: mission performance, mission reliability, communications, transportability, logistics, operator diagnostics and verification of corrections to deficiencies identified during previous testing. It was conducted at Fort Gordon, Georgia, from 5 June to 30 July 1986 by personnel of the United States Army Communications-Electronics Board under the overall supervision of the Army's Operational Test and Evaluation Agency (OTEA). Test plans were approved by the Director of Operational Test and Evaluation, and representatives of this office observed the testing. Test hardware consisted of six V2 configured systems and four operational "float" systems. All hardware was randomly selected from systems currently in use by field units. The test was conducted on a 24-hour, five-day-a-week basis. Each 12-hour shift included the following: Five hours of standard installation division personnel system (SIDPERS) data input and retrieval while operating in a small floorless tent, pack up and move by tactical vehicle for 25 kilometers, unpack, and set up in another tent, operation in the standby mode for four hours, conduct of communications tests and one half-hour of preventive maintenance.

The following test limitation existed, but did not invalidate the test results. The test scenario called for immediate exchange of failed components to allow for continuous collection of reliability, availability and maintainability (RAM) hours. This precluded assessing the impact of transit times on mission performance.

Results of the follow-on operational test led to the following findings:

- o Mission performance: During the test, the system successfully completed 97.7% of the assigned missions.

- o Mission reliability: The demonstrated reliability of 373.6 hours Mean Time Between Operational Mission Failure (MTBOMF) during this test exceeded the user's stated requirement of 180 hours. It was observed that 74% of all maintenance actions during the test related to electrical cable connectors. Modifications to the connectors have been developed and satisfactorily tested by the Army subsequent to the follow-on operational test.

- o Communications: TACCS successfully demonstrated the ability to exchange information with another TACCS as well as several other existing Army computer systems using various tactical and commercial communications links.

- o Transportability: TACCS was transported without requiring any corrective maintenance 1) as restrained cargo by tactical vehicles 360 of 366 times (98.3%) and 2) by helicopter 18 of 18 times (100%).

o Logistics supportability: The operator's technical manuals are inadequate and impair the quality of training, the accuracy of operator diagnostic functions and job performance. Operators had problems trying to locate and understand operating instructions and procedures. Additionally, a Standard Army Multicommand Management Information Systems (STAMMIS) manual written for division-level ADP users is necessary to permit customized reports and other management tools to be generated. Maintenance support was satisfactory. However, the soldier maintainer should be authorized to replace component boards, as this is essentially no different from reseating of boards, a procedure he is currently authorized to perform. For example, switching a hard-disc drive could be performed by the repairman in 30 minutes, whereas issuing a replacement TACCS would cost the user four to six hours to reload his software and database information.

o Operator diagnostics: During the first five days of test, the operators had difficulty in adequately performing their diagnostic functions. These difficulties were due primarily to problems with the operator's manual. Of nine diagnostic incidents during this period, the operator correctly diagnosed one, and performance of this one action was not accomplished within the 30 minute minimum time requirement. During the remaining 30 days of testing there were 42 diagnostic incidents. The operators correctly diagnosed 37. However, the operators exceeded the 30 minute time limit on three incidents (total time varied from 35 to 41 minutes). While operator performance improved with experience, improvements in the operator's manual will facilitate learning and enhance diagnostic capabilities.

o Verification of fixes: Test results indicate that problems noted with the following during previous tests have been corrected.

- oo Failure of the tape archive to capture data transferred from hard disc,

- oo Excessive grounding current,

- oo System failures due to high temperature and humidity, and

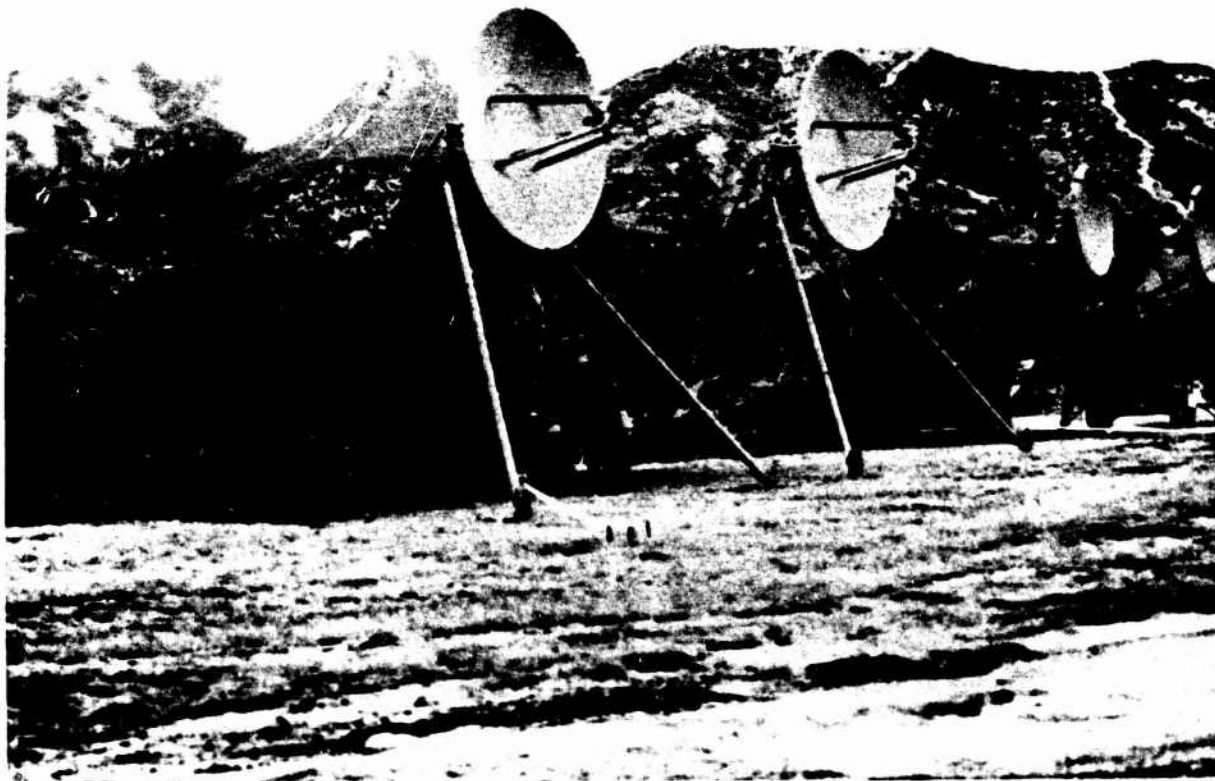
- oo System failures due to dusty environment.

o Additional observation: The Army should identify and obtain a TACCS-compatible high speed printer that divisions could use in garrison to print out the numerous and lengthy required reports. This would speed up production and prolong the life of the TACCS printers.

SUMMARY

As tested, the TACCS demonstrated an operationally effective capability to perform the following Army-wide applications: the Standard Installation Division Personnel System (SIDPERS), the Standard Army Maintenance System (SAMS), and the Standard Army Retail Supply System (SARSS). Additional planned applications have not yet been tested. While the TACCS is suitable for use, improvements to the operators manuals are required to permit users to readily and fully utilize the TACCS capability.

JOINT TACTICAL COMMUNICATIONS (TRI-TAC)



SYSTEM DESCRIPTION

The TRI-TAC is a major acquisition program with each Service developing segments of the total required capability. This report covers only the AN/TRC-170(V) equipment on which there was test activity in FY86. The AN/TRC-170(V) is a Tropospheric Scatter Radio Terminal Set used for secure voice, data and record message traffic. The AN/TRC-170(V) is intended to provide extended range multi-channel communications at corps level and echelons above corps. There are two versions of the AN/TRC-170(V). The V2 version provides a quad-diversity tropospheric scatter capability. It is installed in an S-280 shelter, mounted on a wheeled mobilizer and towed by a 2-1/2 ton truck. The V2 version has a planning range of 150 miles. The V3 version provides a dual-diversity tropospheric scatter capability. It is installed in an S-250 shelter, mounted on a 2 1/2 ton truck and has a planning range of 100 miles.

BACKGROUND

The AN/TRC-170 program was established as part of the TRI-TAC program with the U.S. Air Force as the lead Service for development and acquisition. Following a competitive solicitation the full-scale engineering development contract was awarded in June 1976 to Raytheon Corp. Joint DT&E and IOT&E was conducted from May 1979 through August 1980 at Fort Huachuca, Arizona. In May 1981 a joint TRI-TAC review board approved production of the AN/TRC-170 without the electronic counter-countermeasure (ECCM) hardware. A sole-source contract was awarded to Raytheon Corporation for 110 systems. Deficiencies identified during the 1980 IOT&E were addressed by the contractor through requalification testing during April-June 1981. An Army in-process review (IPR) in December 1982 approved a type classification of "limited production." Type classification as "standard" was denied because of concerns identified during the 1980 IOT&E. The Army approval was conditioned upon another operational test prior to fielding. In January 1985 the first production AN/TRC-170 systems were delivered and installed. In April 1985 the Army reclassified the AN/TRC-170 (V2 V3) as "standard" subject to the conduct of a follow-on evaluation (FOE) to confirm that the concerns identified during the 1980 IOT&E had been resolved. Specific concerns included interoperability, and logistics supportability. An Army FOE is being conducted at Fort Huachuca from September through November 1986. The anti-jam electronic counter-countermeasures (ECCM) capability of the AN/TRC-170, which was unsuccessfully tested in 1980, was deferred for later inclusion in the AN/TRC-170 program as a production improvement. The ECCM modules are expected to be available for testing in 1989.

OT&E ISSUES

The 1980 IOT&E identified several problem areas, including: reliability, performance, survivability, interoperability, maintainability, training, documentation and transportability. The Army FOE currently being conducted at Fort Huachuca is expected to address these issues with the exception of survivability under electronic countermeasure (ECM) threat. Contract award for the product improvements designed to improve the AN/TRC-170's performance under electronic warfare (EW) threat environments is expected this fiscal year and availability of the hardware for testing is expected to be available in 1989. Subsequent operational testing of the AN/TRC-170 is expected to be scheduled to address this issue.

OT&E ACTIVITY

The Army AN/TRC-170 FOE is currently in progress at Fort Huachuca. There are currently no plans to test the AN/TRC-170 under EW threat conditions. Several product improvements are planned to enhance the ECCM performance.

OT&E ASSESSMENT

On-going Army testing has not been completed, and an assessment of the results is not available. The production-version AN/TRC-170 has not been adequately tested under operational EW conditions. An assessment of the AN/TRC-170 system will be made following the completion of the on-going Army testing and publication of the test report.

SUMMARY

Assessment of the performance and suitability of the TRC-170 for fielding will be made following the current testing being conducted by the Army at Fort Huachuca. As soon as the product improved hardware is available, additional testing is required to address the survivability of the AN/TRC-170 under EW conditions.

PART IV
NAVY OT&E



SYSTEM DESCRIPTION

The A-6E is the Navy's only all-weather attack aircraft. Its avionics system includes a microminiaturized digital computer, a solid-state weapon release system, a single integrated track and search radar, and a Carrier Airborne Inertial Navigation System (CAINS). An added capability, Target Recognition Attack Multisensor (TRAM), has been procured since FY76. This major subsystem of the A-6E is procured under a multiyear production contract and includes an infrared sensor, laser ranger/designator, and laser receiver. It provides the capability for delivery of laser-guided weapons and increased night surveillance and identification capability. The aircraft is a long range, twin-jet, carrier-based, attack aircraft capable of very accurate navigation and delivery of nuclear and non-nuclear weapons from five external store stations.

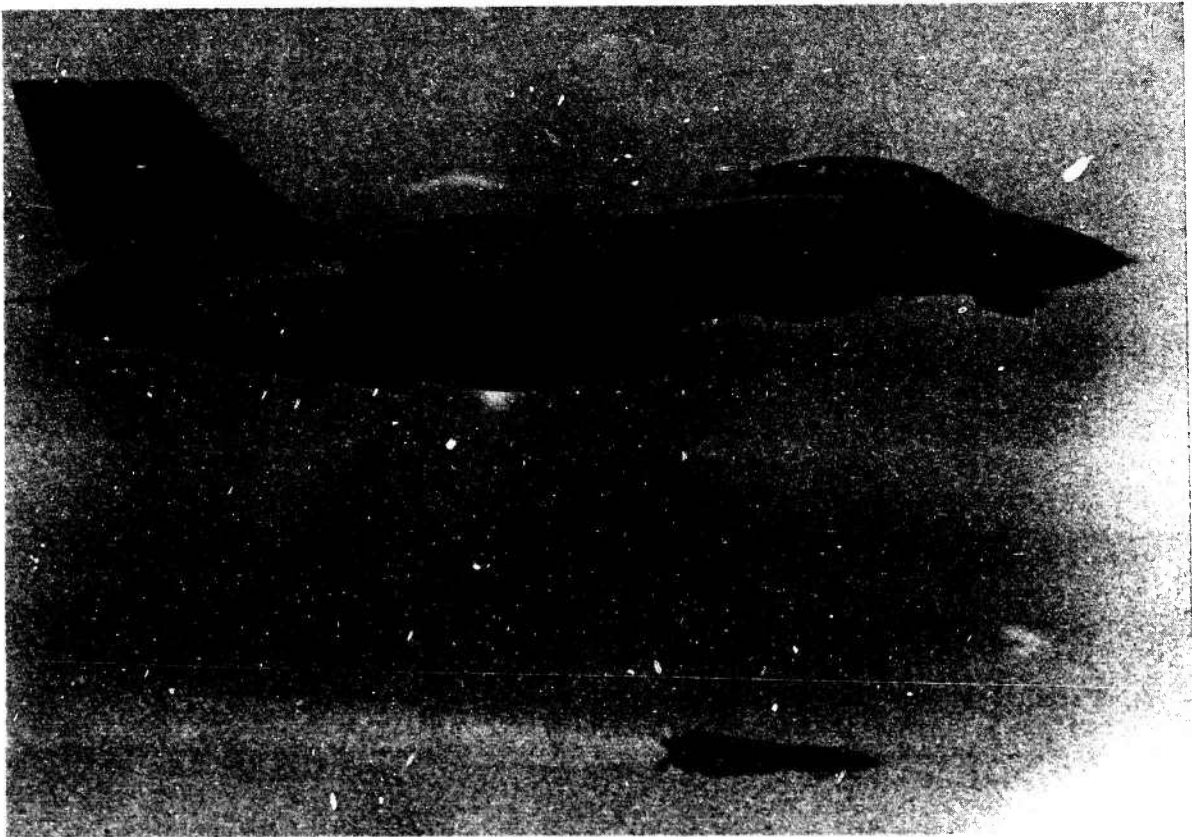
BACKGROUND

The first flight of the A-6E was in 1970. A-6E production is ongoing and beginning in FY88 the A-6F will commence limited production. The A-6F will be an improved version of the A-6E, incorporating improvements in reliability, performance and survivability through improved avionics, propulsion and minor airframe changes.

OT&E ACTIVITY

Follow-on test and evaluation of the A-6E in FY86 completed testing of updated avionics software (OFP-E230), with release to the fleet in July 1986.

AIM-54 A/C PHOENIX MISSILE



SYSTEM DESCRIPTION

The PHOENIX missile system is comprised of a long-range airborne weapons control system with multiple target-handling capabilities and long-range missiles utilizing semi-active midcourse guidance and active terminal guidance. Its mission is to destroy multiple air targets with conventional warheads. Six PHOENIX missiles can be carried aboard the F-14A/D. Near simultaneous launch is possible against six targets in all-weather, heavy jamming environments. The improved PHOENIX, the AIM-54C, provides improved lethality, discrimination, ECCM performance, high and low altitude performance, and increased reliability and maintainability. Additionally, the AIM-54C has been designed to operate in a "dry configuration" (liquid coolant has been removed from the system), providing significant weight savings to the F-14. As a result of these improvements, the missile has greater capability to counter the projected aircraft and missile threats until introduction of the follow-on Advanced Air-to Air Missile in the mid 1990s.

BACKGROUND

The AIM-54A ended production in 1979 at the same time that a major missile upgrade was required to meet a more sophisticated threat. The AIM-54C, currently in low rate production, is a significantly improved missile which requires further evaluation before approval for full production is requested in late FY87. Operational evaluation (OPEVAL) of the AIM-54C was completed in August 1984.

OT&E ISSUES

Operational effectiveness issues remaining after OPEVAL were addressed in a first phase of follow-on operational test and evaluation in FY86 and included missile/weapon system effectiveness against representative targets in electronic countermeasures (ECM) and non-ECM environments, over water and over land, and possible missile performance degradation due to new firmware. Suitability issues examined were missile reliability, compatibility, interoperability, fleet training, human factors and safety.

OT&E ASSESSMENT

There were no limitations to the scope of the first follow-on test and evaluation which precluded an evaluation of the missile's operational effectiveness and suitability, but some targets were not fully representative of actual threat size and maneuverability. The test operations included launch missions, captive missile data flights and a captive carry flight program using two missile firing ranges and aircraft carrier operations.

SUMMARY

The first phase of follow-on test and evaluation was successfully completed, and results will be used in the second phase beginning in early FY87.

AV-8B USMC LIGHT ATTACK AIRCRAFT



SYSTEM DESCRIPTION

The AV-8B is a single-place, transonic, vertical/short takeoff and landing (V/STOL) light attack airplane. It incorporates a super-critical wing, positive circulation flaps, lift-improvement devices and enlarged intakes to improve V/STOL performance over previous AV-8 models. An updated weapons system is incorporated to improve weapons delivery effectiveness and tactical flexibility. The AV-8B has fuselage cheek-mounted 25mm gun blisters and is capable of carrying a variety of conventional weapons on seven weapons stations, four of which can also carry external fuel tanks.

BACKGROUND

The AV-8B is designed to replace AV-8A/C and A-4 airplanes to meet Marine Corps light attack requirements through the year 2000. Milestone II occurred in June 1979 after completion of the YAV-8B program, which was designed to minimize the risk associated with new airframe technology. Navy flight testing commenced in June 1982. In FY84, AV-8B test results resulted in a recommendation for limited fleet introduction. A two-phase operational evaluation completed in March 1985 resulted in a full production decision in May 1985. During testing, the AV-8B demonstrated an operationally effective capability for the land based Marine Corps close air support mission and secondary air-to-surface missions, and limited effectiveness when operating from Landing Helicopter Assault (LHA) class ships and in the secondary air-to-air combat roles. It was considered operationally suitable with modifications required on LHA ships to make them compatible for AV-8B operations.

OT&E ISSUES

Issues remaining after operational evaluation (OPEVAL) include no electronic warfare suite, air-to-ground ordnance clearances for only three types of bombs and two types of rockets and no assessment of AV-8B chemical and/or biological warfare characteristics. Testing of these remaining issues is planned to be conducted in a series of follow-on test and evaluation (FOT&E) periods in FY87. Portions of FOT&E will coincide with fleet deployment of the AV-8B.

OT&E ASSESSMENT

Follow-on testing in FY86 included verification of the operational effectiveness and operational suitability of the radar warning receiver ALR-67 and development of employment tactics. Integration of the AGM-65E (LASER MAVERICK) missile was also completed.

BLU-80B CHEMICAL WEAPON SYSTEM (BIGEYE)



SYSTEM DESCRIPTION

The BIGEYE is a 500 pound class freefall canister binary chemical weapon designed for single or multiple carriage on tactical fighter/attack aircraft. Capable of supersonic carriage and high subsonic release airspeeds, BIGEYE is designed to be compatible with level, loft and dive deliveries. It produces a persistent nerve agent from two nontoxic chemicals which are physically separated within the BIGEYE airframe until the weapon has been released from the aircraft. The basic components of the BIGEYE weapon include the FMU-140/B dispenser proximity fuze, reactor assembly (including liquid reactant (QL)), ballonet assembly (including sulfur reactant) and tail fin assembly.

BACKGROUND

Inherent problems with the storage, transportation and employment of toxic chemical weapons led the DoD to seek a safer, more reliable method to achieve chemical warfare deterrence. A binary concept, two nontoxic chemicals physically separated until used, evolved as the most plausible solution to this need. In 1976 the Navy was designated as Executive Service for development of the BIGEYE, with the Air Force as Participating Service and the Army as the Supporting Service responsible for chemical development and evaluation. Funding shortfalls in FY80 resulted in a restructuring of the program and a decision to place the program in a hold status at the end of that year. Renewed interest in the program during FY81 resulted in a decision to complete development as quickly as possible. The design of the system was changed in FY82 to allow the chemical reactant to mix after the weapon was released from the aircraft ("off-station mixing"). Operational testing of this design began in FY85.

OT&E ISSUES

The operational effectiveness issues to be examined during operational testing include delivery accuracy of the system, capability of providing desired deposition densities when delivered with operationally realistic maneuvers, successful employment under all conditions encountered during mission operations and whether the required delivery maneuvers will result in an unacceptable increase in delivery aircraft vulnerability. Suitability issues will deal with reliability, maintainability, logistic supportability, environmental compatibility, interoperability, and safety during transportation, handling, loading, delivery, and jettison from the aircraft.

OT&E ACTIVITY

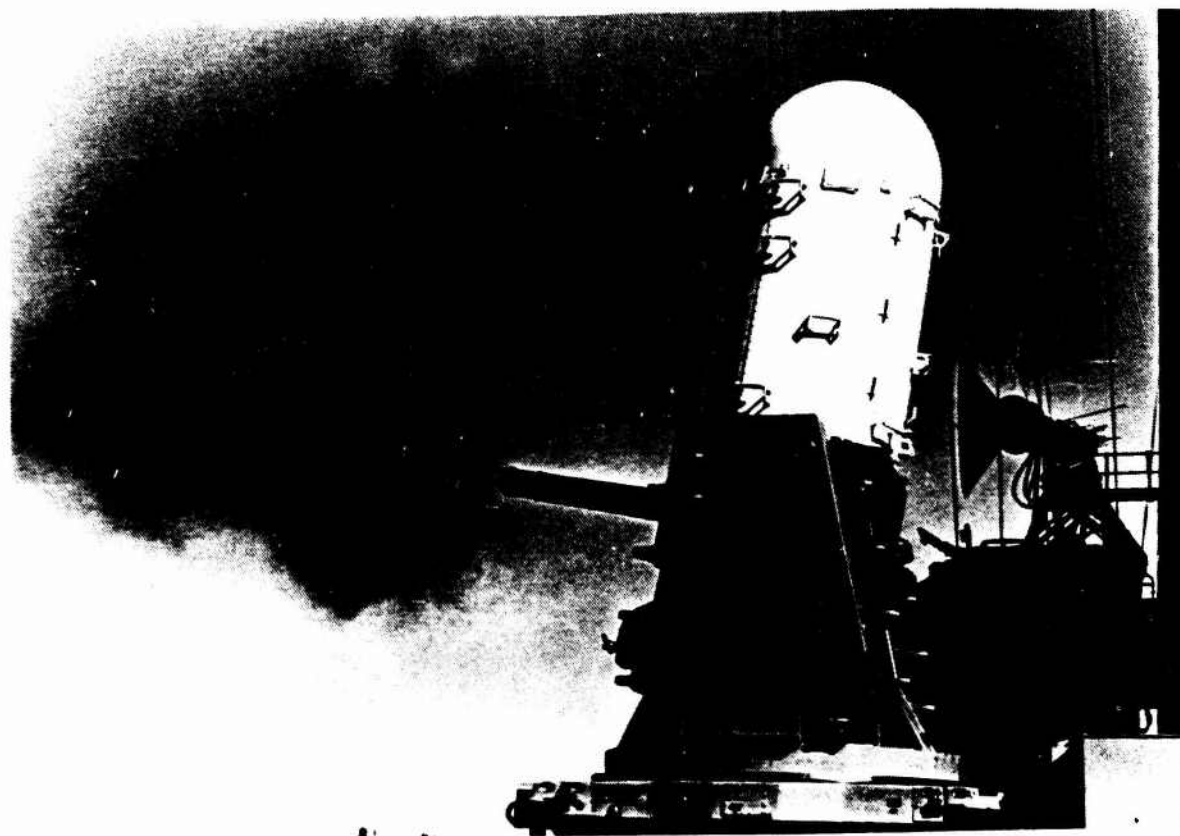
Navy and Air Force are conducting operational testing in two phases. The Navy completed Phase I testing (OT-IIA) 5 September 1985. Twenty-two weapons were dropped at Naval Weapons Center, China Lake, California, and Dugway Proving Ground (DPG), Utah. Commander, Operational Test and Evaluation Force (COMOPTEVFOR) concluded that the BLU-80/B was potentially operationally effective and potentially operationally suitable, supporting a recommendation for limited production, and recommended withholding approval for limited fleet introduction until compliance with several recommendations.

The Air Force IOT&E, Phase I was conducted by U.S. Air Force Tactical Air Weapons Center (USAF TAWC) from Nellis AFB, Nevada, from April 1985 to February 1986. Twenty BLU-80B weapons were dropped from F-4 and F-16 aircraft at China Lake and Dugway. The Air Force concluded BLU-80/B operational effectiveness was satisfactory and operational suitability was unsatisfactory and recommended proceeding to low-rate initial production (LRIP).

Phase II of operational testing is scheduled to begin in January 1987, with the Navy and the Air Force conducting testing under a single coordinated test and evaluation master plan (TEMP) and test plan. The purpose of this testing is to determine the operational effectiveness and operational suitability of the BLU-80/B, and continue tactics development in order to support promulgation of an COMOPTEVFOR Tactics Guide. Successful completion of OT-IIB/IOT&E Phase

II will support a recommendation regarding inventory/fleet introduction. Results of this testing will be considered at the Milestone IIIB decision for full production.

CLOSE-IN WEAPON SYSTEM (CIWS)



SYSTEM DESCRIPTION

CIWS is designed as a fast-reaction terminal defense against high-speed anti-ship missiles penetrating other fleet defenses. The system is an automatic, self-contained unit consisting of a search and track radar, digital fire control system, and a 20mm M61A1 gun--all mounted in a single, above-deck structure requiring a minimum of interface with other ship's systems. CIWS provides a new capability and does not replace any existing system.

BACKGROUND

CIWS attained initial operating capability in 1979 and has continued to undergo follow-on operational test and evaluation (FOT&E) since then. During FY85 a Block 1 upgrade to CIWS underwent initial operational test and evaluation (IOT&E) and was found sufficiently operationally effective and suitable to support a decision to shift production from the Block 0 to Block I variant.

OT&E ISSUES

FY86 FOT&E attempted to examine issues not resolved during earlier testing of the Block 0 CIWS variant. Several of these issues, particularly those involving effectiveness and tactical guidance, are common to both the Block 0 and Block I systems. CIWS OT&E issues planned for resolution included: several areas of operational effectiveness; interoperability with AEGIS; and correction of reliability, maintainability and safety deficiencies.

OT&E ASSESSMENT

FOT&E was conducted in conjunction with regular fleet operations, and no specific resources were allocated for testing. Test events included fleet firing and tracking exercises, and fleet records were reviewed for operational suitability data. However, test operations were satisfactory to resolve only a few of the above issues.

SUMMARY

Navy operational testers are continuing to attempt to resolve CIWS OT&E issues using available fleet resources. Although some issues were resolved, the testing was too limited to reach any conclusions. Six of 18 CIWS critical operational issues have not been completely resolved. The operational evaluation of the CIWS Block I is scheduled for FY87, and the above test limitations and deficiencies will be addressed in this test.



SYSTEM DESCRIPTION

The CH-53E is an improved/growth version of the Navy/Marine H-53A/D transport helicopters. It features a third engine, a larger diameter rotor, seven versus six main rotor blades, an uprated main transmission, and a greater maximum gross weight and payload capability. Maximum payload is 16 tons for the CH-53E vice 8 tons for the earlier H-53A/D aircraft. The CH-53E is currently in full production and is employed by both Marine Corps and Navy fleet units. A variant of the H-53E, the MH-53E, is currently in limited production for use in the airborne mine-countermeasures (AMCM) mission. There is an 80% commonality between the MH and CH aircraft, with the main rotor, engines, transmissions, and basic airframe being essentially the same.

BACKGROUND

The MH-53 is being developed as an Engineering Change Proposal modification to the CH-53E aircraft to replace the RH-53D as the Navy's airborne AMCM platform. The MH-53E is designed to increase time on station and improve mission reliability, as well as to provide the increased tow capability required by new AMCM devices. Initial operational testing (OT--IIA) was conducted in 1984. Based on OT-IIA and DT-I test results, a limited production decision was made in April 1985. DT-II was completed in October 1985.

OT&E ISSUES

During the FY86 operational evaluation (OPEVAL) of the MH-53, operational effectiveness objectives included a determination of the MH-53's capability to stream, tow and recover AMCM towed bodies and to navigate with the accuracy required to conduct AMCM operations. Other objectives determined capability to conduct vertical on-board delivery and in-flight refuel from surface and airborne platforms and assessed the survivability and vulnerability of the MH-53. Operational suitability objectives determined the reliability, maintainability and availability of the MH-53. In addition, logistic supportability, compatibility, training documentation, human factors, safety, convertibility and transportability were evaluated.

OT&E ASSESSMENT

The operational evaluation was a test of a preproduction aircraft operated and maintained by personnel representative of a fleet squadron during operations conducted from January to April 1986. Test limitations existed and will require further testing, but did not preclude evaluation of operational effectiveness and suitability. Limitations were shipboard testing of interoperability, conducted only aboard one class of ship; production representative maintenance publications not being available for MH-53 peculiar items and helicopter in-flight refueling for interoperability limited to dry hookups due to test ship failure. The operational effectiveness of the MH-53 was satisfactory, demonstrating the capability to conduct AMCM operations during daylight visual meteorological conditions in a 171.0 flight hour program. The MH-53 demonstrated the ability to stream the seven tested AMCM devices, although the heavy rotor wash caused device to spin during streaming. The MH-53 demonstrated the capability to tow and recover all devices. MH-53E survivability and vulnerability assessments concluded that the MH-53E was at least as survivable and no more vulnerable than the RH-53D and CH-53E. The vertical on-board delivery and navigation capabilities of the MH-53E were satisfactory, with no deficiencies noted during the evaluation. The operational suitability evaluation demonstrated that reliability and maintainability were better than the criteria. Operational availability of the MH-53E was less than the criterion and was primarily attributable to the high failure rate/replacement of main and tail rotor bearings. No major deficiencies were noted in logistics supportability. Compatibility testing noted that salt spray induced by rotor wash caused excessive engine salt encrustation during downwind tow when compared to RH-53D.

Interoperability of MH-53E during in-flight day/night refueling was fully demonstrated with the KC-130. The MH-53E also demonstrated interoperability with the LPD class ship within certain weight and parking spot limitations,

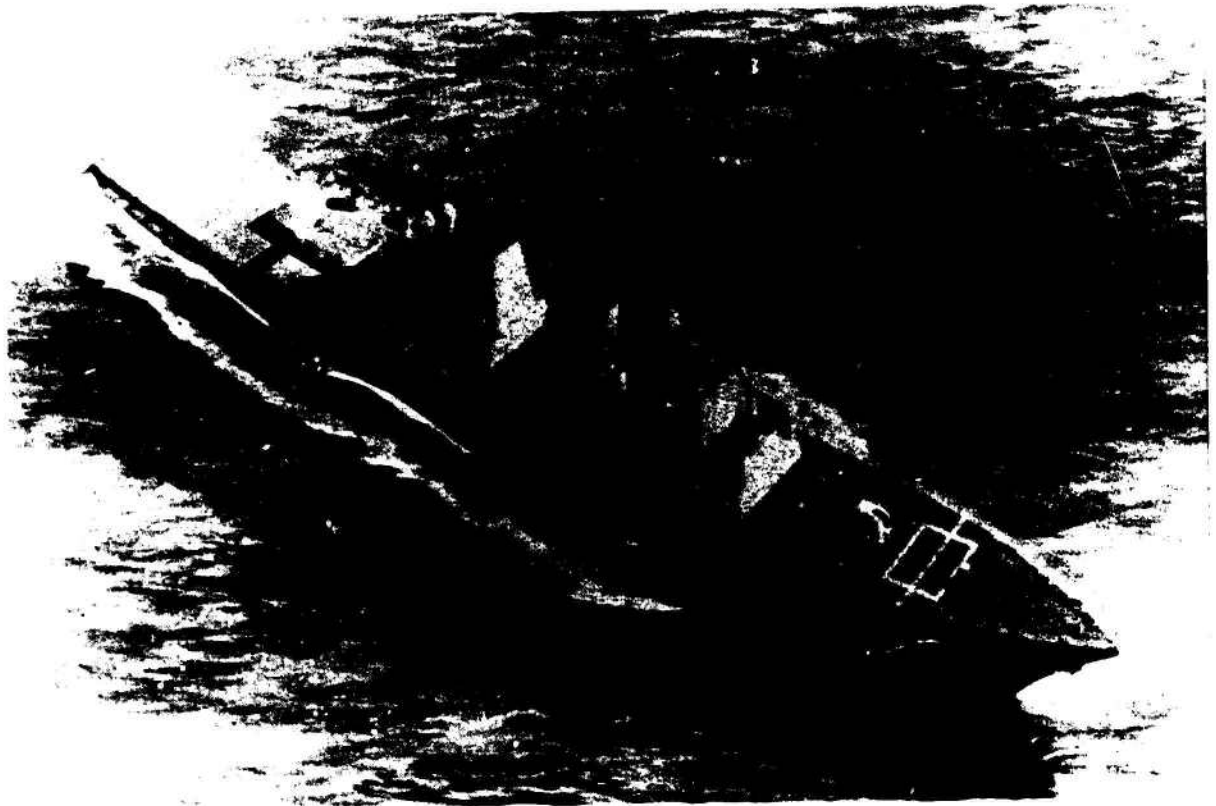
with similar limitations projected for other classes of ships. No major deficiencies were noted in training or documentation. Several items were noted in the human factors evaluation including the size, location, and readability of the tension skew indicator, which is concerned with the tension of the tow cable to the AMCM device.

Safety items were of concern in the evaluation included recovery from single engine failure, restriction of cyclic (control stick) full throw in case of emergency and high noise level in the aft cabin area. Transportability was demonstrated through observation of the loading of a CH-53 (with mock sponsors replicating the MH-53) on to a C-5A aircraft. This capability will be evaluated in future testing.

SUMMARY

As tested, the MH-53 was considered operationally effective given possible operational limitations with rotor wash-induced salt spray causing power deterioration in certain wind conditions, shipboard maintainability (test results were based primarily on land-based operations) and different weight limitations on LPH, LPD and LHA class ships.

The MH-53 was judged not operationally suitable. The test results did not support full production of the MH-53 until identified discrepancies were corrected and verified in further operational testing. The discrepancies included recoverability with single-engine failure during tow operations, full throw authority of the cyclic during emergencies, readability of the tension skew indicator, durability of the main and tail rotor bearings, and rotor brake slippage. Follow-on testing of transportability and corrections to the deficiencies will be monitored by DOT&E and reported on in our Annual Report for the fiscal year in which it is conducted.



SYSTEM DESCRIPTION

The ARLEIGH BURKE class multi-mission guided missile destroyer, DDG-51, is planned to replace existing guided missile destroyers in the late 1980s. It is designed to carry out offensive and defensive operations as a unit in carrier battle groups and surface action groups, or as the lead combatant in support of replenishment and amphibious groups. With two Mk-41 vertical launch systems, DDG-51 will be armed with a mix of 90 missiles which can be varied to support any of its specific missions.

The DDG-51 area defense antiair warfare (AAW) capability is provided by the AEGIS Weapons Systems, which is similar to that deployed on the TICONDEROGA (CG-47) class cruiser, and by the vertically launched SM-2 surface-to-air missile. For antisubmarine warfare (ASW) DDG-51 will use the SQQ-89 surface ASW combat system employing hull and towed array sonars, the LAMPS Mk III ASW helicopter, the Vertical Launch ASROC and Mk-46 torpedoes. DDG-51 will also employ TOMAHAWK and HARPOON missiles and the 5 inch/54 gun for antisurface and strike warfare missions. The DDG-51 will use a CG-47 type propulsion system.

BACKGROUND

The DDG-51 class ship completed contract design in FY84, and the shipbuilding contract for the first ship of the class was awarded in FY85. Based on the in-service experience and operational test results of those planned DDG-51 systems which are already in service or have previously undergone operational testing on other platforms, and the operational test results of the DDG-51 unique AEGIS weapon system conducted during FY86, the Navy decided to procure additional ships of the DDG-51 class. This decision was preceded by the 10 U.S.C. 138 required report to the Committees on Armed Services and on Appropriations of the Senate and the House of Representatives when a weapon system proceeds beyond low-rate initial production (LRIP).

OT&E ISSUES

The primary OT&E issue examined during FY86 operational testing was the ability of the DDG-51 combat system, including its SPY-1D radar, to detect, and track threat-representative targets. Other issues included the interoperability of the various DDG-51 combat system elements, their reliability, maintainability and availability, and the ability of fleet personnel to operate and maintain them safely.

OT&E ASSESSMENT

Test operations were conducted at the Combat System Engineering Development Site (CSEDS), Moorestown, New Jersey, in a manner similar to those conducted during early AEGIS testing. Testing consisting of 12 manned aircraft raids. In addition to the manned aircraft, dynamic test targets were presented during the raids to evaluate radar performance against the targets which could not be simulated by aircraft due to physical and safety constraints. Testing was limited considerably by the early stage of combat system development. The constraints of a land based test site, the 60-hour duration of the test and the environmental conditions experienced during the test period also limited test realism.

The performance of the SPY-1D radar was consistent with the performance of the other models of the SPY-1 radar during previous operational tests at CSEDS. There were no critical or major failures during the test operations, but a number of other malfunctions, interrupts and deficiencies were identified. The training was sufficient to enable personnel to operate the system and perform routine maintenance.

SUMMARY

Given the early stage of development of the DDG-51 combat system and SPY-1D radar and other constraints, the operational testing was conducted in as operationally realistic an environment as possible. These systems demonstrated many of the antiair warfare capabilities of the planned DDG-51 and have shown progress towards achieving suitability thresholds. The OT&E issues were partially resolved, and the DDG-51 combat system and SPY-1D radar were potentially operationally effective and suitable.

EXTREMELY LOW FREQUENCY (ELF) COMMUNICATIONS SYSTEM



SYSTEM DESCRIPTION

The Navy extremely low frequency (ELF) communications system is used to deliver message traffic one-way from the continental United States to deployed submarines (SSBNs and SSNs) at operational depths and speeds. The unique seawater penetrating characteristics of ELF permit deployed submarines to receive messages without deploying antennas or other observables at or near the seawater surface. The system consists of a message input segment at K.I. Sawyer Air Force Base, Michigan, a transmitter segment consisting of two transmitter sites in Wisconsin and Michigan, a broadcast control segment controlled by the COMSUBLANT broadcast control authority at Norfolk, Virginia, and a receiver segment located on SSN/SSBN submarines and at selected shore sites. The transmitter segment is a soft, surface deployed subsystem with antijam and electromagnetic pulse protection of the transmitters, which are not expected to survive a hostile physical attack. Although the transmitter sites are designed to operate together for maximum area coverage, a single site can be used at reduced ranges and increased transmission times.

BACKGROUND

The initial ELF work from 1958 to 1962 was largely theoretical and experimental. A conceptual SANGUINE baseline system was designed in 1967 to identify problem areas. A Wisconsin test facility constructed in 1968 successfully demonstrated that SANGUINE electromagnetic interference could be mitigated. A Defense System Acquisition Review Council (DSARC) review in 1972 approved the SANGUINE to enter concept validation phase. In 1975 a World-Wide Military Command and Control System (WWMCCS) Council authorized continuing the design validation of SEAFARER, which was deployed as a soft ELF system. Following a 1978 DSARC, an austere ELF system was directed and curtailed funding followed. In 1981, Congress sought a presidential decision before authorizing funds, and on 8 October 1981 a decision was received to proceed with the deployment of an ELF communications system. As a result, 20 engineering development model receivers in conjunction with an upgraded Wisconsin transmitter facility were procured for further test and evaluation to support a procurement decision for receivers to go into operational submarines. Development testing was conducted from May through September 1985. ELF is not a major acquisition program but was designated for DOT&E oversight in accordance with 10 U.S.C. 138.

OT&E ISSUES

OT&E issues examined during FY86 ELF testing include: the achievement of area coverage and communications connectivity sufficient to support submarine mission requirements, restraints on submarine operational flexibility, system survivability and vulnerability, the full range of suitability issues including interoperability with the Minimum Essential Emergency Communications Network (MEECN) and the submarine OE-315 antenna system.

OT&E ASSESSMENT

Operational testing consisted of the ELF transmission of operational messages and test messages to three submarines (2 SSBN, 1 SSN), which were conducting normal patrols and operations in the Western Atlantic, Eastern Atlantic and Eastern Pacific areas. Transmissions were made using only the Wisconsin Transmitter Facility (the Michigan facility was not yet operational). Operations were conducted from November 1985 through April 1986.

During the test the best reception was obtained when the submarine was operating within the prescribed reception envelope, although reception outside the envelope was also demonstrated. This envelope allowed for sufficient submarine operating flexibility.

The reliability of the transmitter segment failed to meet criteria (mean time between failure of 135 hours versus a criterion of 250 hours). The reliability of the other ELF segments, broadcast control, message injection and receiver was satisfactory. Maintainability of the transmitter segment was satisfactory, but that of the other segments exceeded criteria. Overall the operational availability of all segments and the system as a whole was satisfactory. Interoperability between the three ELF shore segments was reduced by one critical and 102 minor data link and orderwire failures, which resulted in 210 hours when the full network was not available. Only the critical failure resulted

in loss of communications. Early production models of the OE-315 antenna experienced flooding failures, but during the last test period no communication failures resulted when an improved version of the OE-315 was used. With the exception of several human factors deficiencies, all other suitability issues were satisfactorily resolved.

SUMMARY

The ELF OT&E satisfactorily resolved five of six operational effectiveness issues and five of 10 operational suitability issues. The remaining issues are sufficiently resolved to conclude that the ELF communications system is operationally effective and potentially operationally suitable. ELF follow-on OT&E will be conducted using a dual transmitter configuration and receivers on the OHIO class submarine in early FY89.



SYSTEM DESCRIPTION

F-14A is a carrier based, tandem seat, variable-sweep-wing, air superiority fighter, possessing an all-weather capability to conduct fleet air defense, engaging multiple targets simultaneously at altitudes from sea level to over 80,000 feet. As a secondary mission, the F-14A has a limited air-to-ground capability. The major subsystems of the F-14A aircraft are twin TF30-P-414 engines and the AN/AWG-9 weapons control system. The two engines are mounted in nacelles on either side and below the centerline of the fuselage and are rated (at sea level, static conditions) at 12,350 pounds thrust (military) and 20,900 pounds thrust (maximum afterburner). The engines also provide power to operate aircraft electrical, hydraulic and environmental control systems. The AN/AWG-9 is a pulse doppler radar which can detect fighter targets at ranges of over 115 nautical miles across a 150 nautical mile front and includes many features not presently available in other aircraft radars. The F-14D is a planned FY89 upgrade of the F-14A weapon system in three major areas: new engines, new digitized avionics and a new digital radar. The existing TF30 engines will be replaced by a marinized version of the Air Force F110 engine for improved reliability and operability throughout the entire operating envelope.

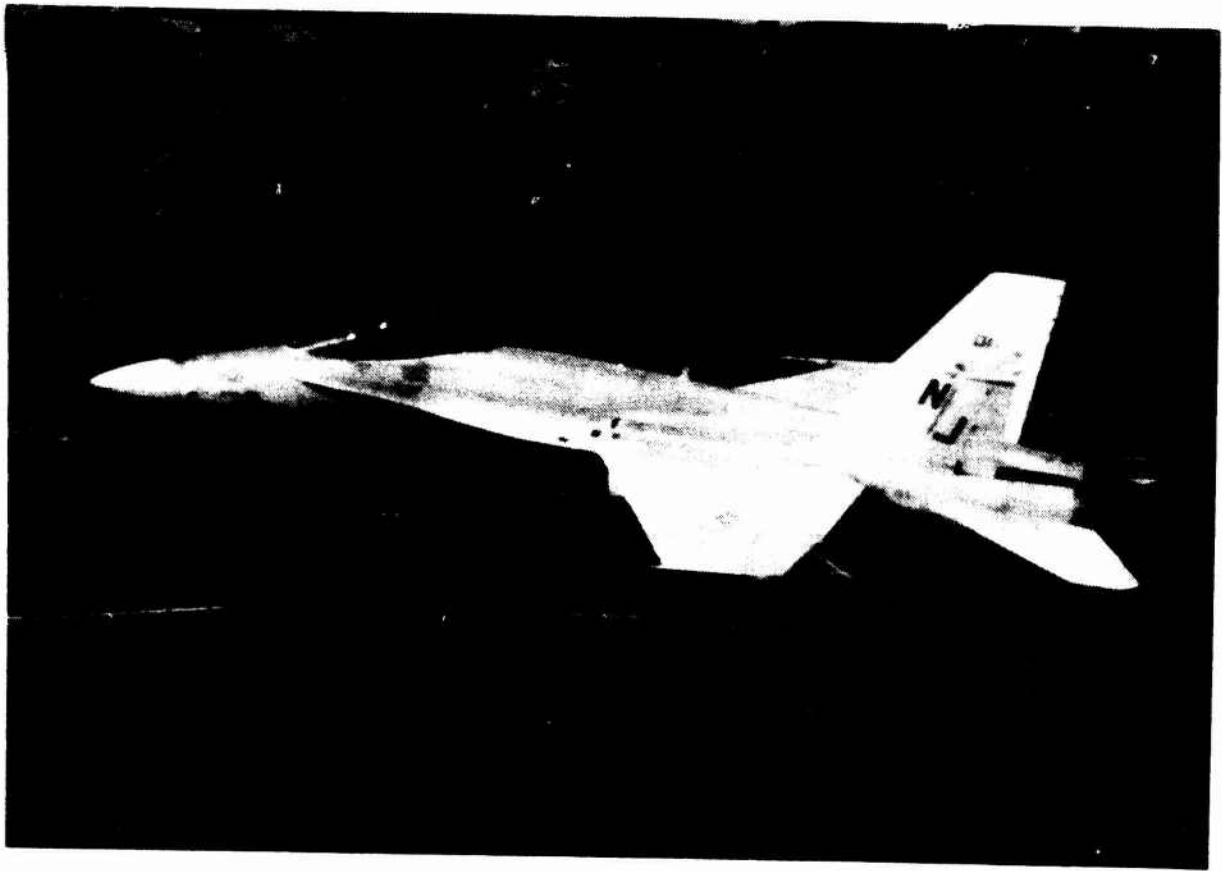
BACKGROUND

First flight of F-14A took place in December 1970. The F-14A production program is nearly complete, while production of the F-14D will commence in late FY89. In the interim, safety and operability problems with the present TF-30 engine have caused the incorporation of the F110-GE-400 engines in all FY86 production aircraft (designated F-14A Plus), which successfully flew in October 1986.

OT&E ISSUES

Follow-on operational test and evaluation conducted in FY86 continued to validate the operational effectiveness and operational suitability of the F-14A/AIM-54A weapon system.

F/A-18 FIGHTER/ATTACK AIRCRAFT



SYSTEM DESCRIPTION

The F/A-18 is a single-place, twin-engine aircraft incorporating a digital control-by-wire flight control system, multiplexed digital avionics and weapons control system, and an APG-65 radar. An electronic warfare (EW) suite is being integrated into the aircraft avionics and consists of a radar warning receiver, an interference blanker, a defensive electronic countermeasures set, and a countermeasures dispensing set, all operating in conjunction with the High-Speed Antiradiation Missile (HARM) system.

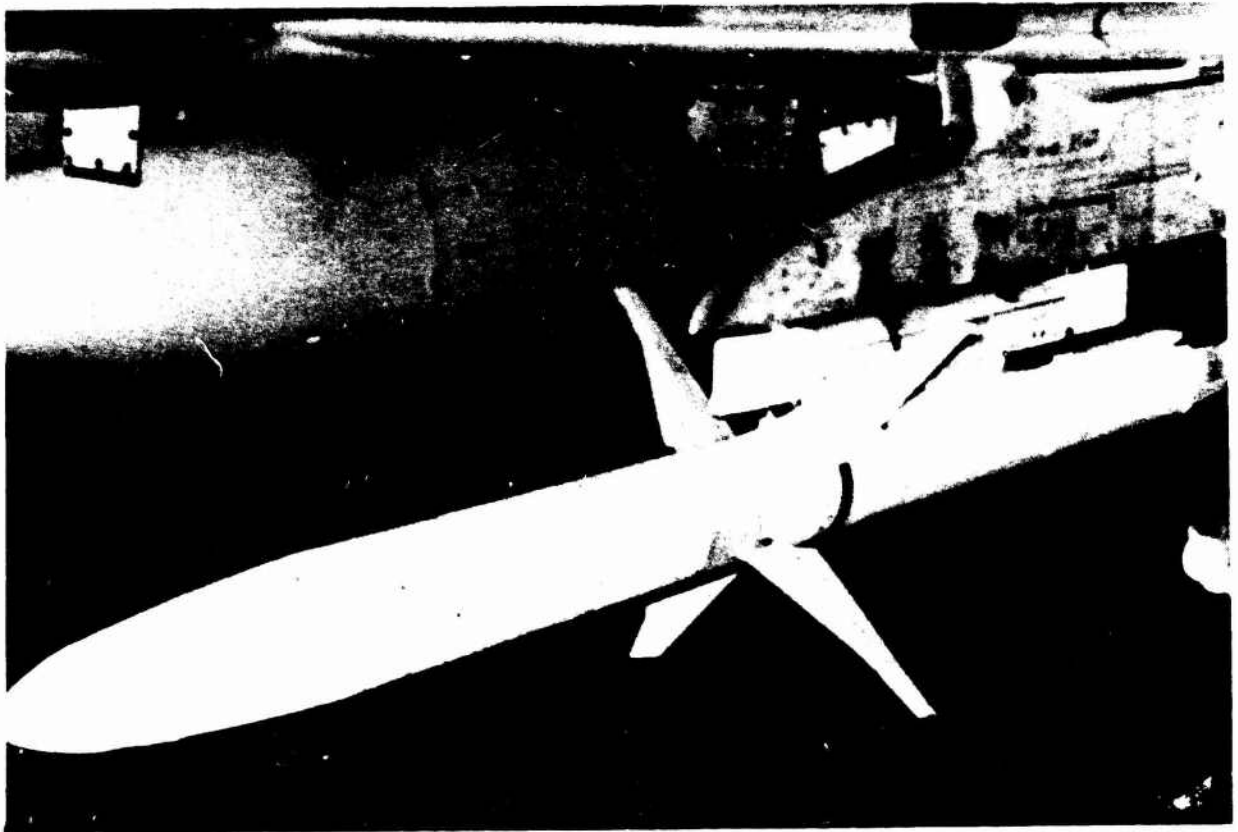
BACKGROUND

Operational evaluation of the F/A-18 was completed in June 1983. All OPEVAL issues, including excessive wind-over-deck requirement for catapult launch, wing oscillation/wing flap lockout, and no in-flight alignment capability were closed by February 1985. The EW suite and HARM system were not available during the aircraft OPEVAL and completed separate OPEVAL in August 1985.

OT&E ISSUES

The major issues examined in FY86 in the follow-on testing of the F/A-18 EW/HARM integration included assessment of the potential suitability of the ALR-67 radar warning receiver, verification of the operational effectiveness and operational suitability of the F/A-18 integrated EW suite/HARM weapon system and development of employment tactics.

AGM-88A HARM (NAVY)



SYSTEM DESCRIPTION

The High Speed Anti-Radiation Missile (HARM) is an air-to-surface missile designed to suppress or destroy land- and sea-based radars which direct enemy air defense systems. HARM was a design evolution of then existing ARM weapons (Strike and Standard ARM) and replaces them in the Navy inventory. HARM has been integrated and successfully deployed on the A-7E and F/A-18 aircraft. It is being integrated into the Navy and Marine Corps EA-6B and A-6E aircraft and in the future will be integrated on the F-14. Performance characteristics include: high speed, large footprint, high sensitivity to weak signals and software adaptability to the constantly changing threat. HARM weighs 807 pounds, is 164 inches long and 10 inches in diameter.

BACKGROUND

Joint U.S. Navy/U.S. Air Force initial operational testing of HARM began in 1979 and resulted in full production and approval for HARM's introduction into the fleet on A-7E aircraft in April 1983. Outstanding deficiencies have been addressed through a missile performance upgrade program. In June-July 1984 the stand-alone HARM weapon system was assessed as being potentially operationally effective when employed on the F/A-18 aircraft. During the period December 1984--July 1985, follow-on operational test and evaluation (FOT&E) of the HARM/integrated electronic warfare (EW) suite on the F/A-18 was conducted, and the HARM was approved for operation for the F/A-18. Current integration efforts are to provide HARM capability for the EA-6B followed by the A-6E.

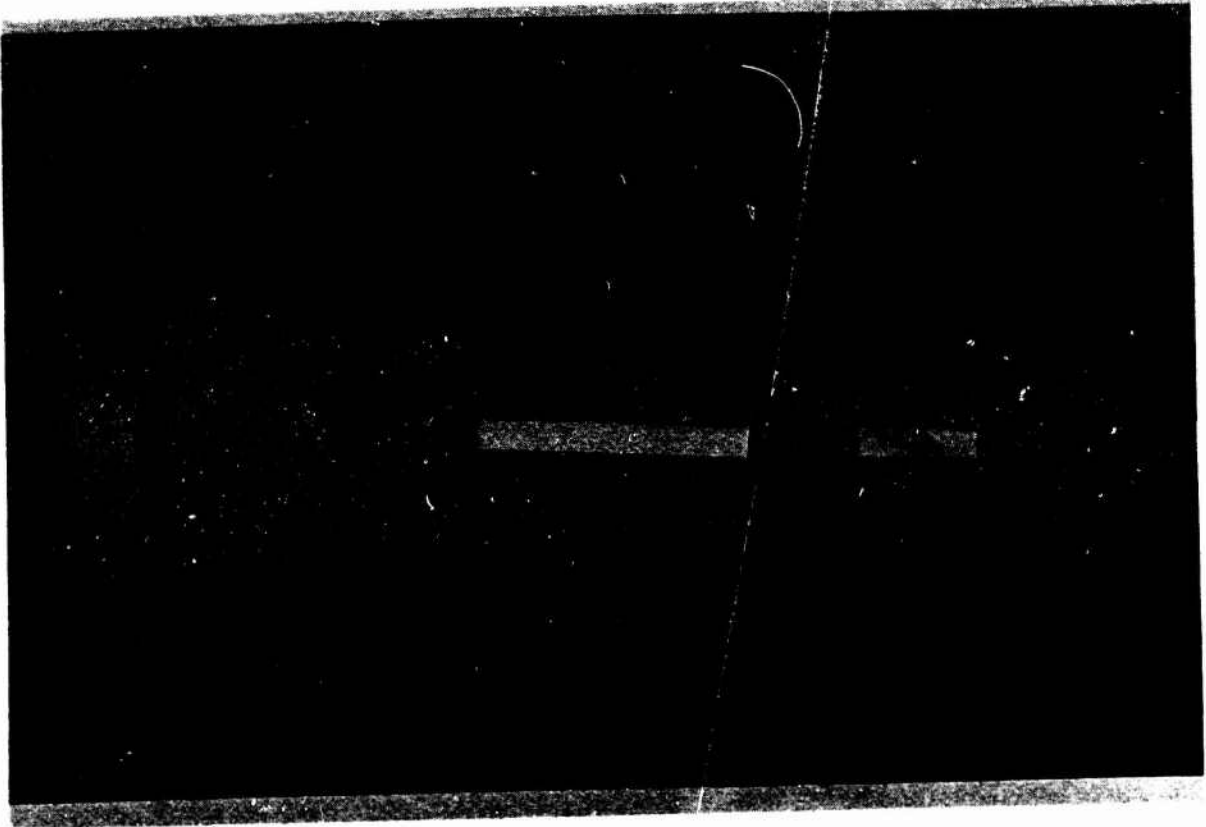
OT&E ACTIVITY

There were no Navy HARM missile performance upgrade activities scheduled during the FY86. Two OT firings were conducted in FY86 in conjunction with the EA-6A HARM integration program. The firings were successful in all phases of EA-6B integration and the EA-6B/HARM was approved for fleet introduction in August 1986.

OT&E ASSESSMENT

No OT&E test reports were completed in FY86.

AGM-65F IR MAVERICK MISSILE (NAVY)



SYSTEM DESCRIPTION

The AGM-65F Navy IR MAVERICK missile is an air-to-surface tactical weapon system which capitalizes on work done under the U.S. Air Force AGM-65D IR MAVERICK program. The automatic infrared homing device provides 24-hour attack capability in reduced visibility conditions against ships, armor, and other hard targets. The AGM-65F uses the Air Force MAVERICK guidance section modified to optimize it for ship tracking while the center-aft section is the same as that used on the Navy/Marine Corps LASER MAVERICK, AGM-65E. The AGM-65F has a blast fragmentation penetrator type warhead.

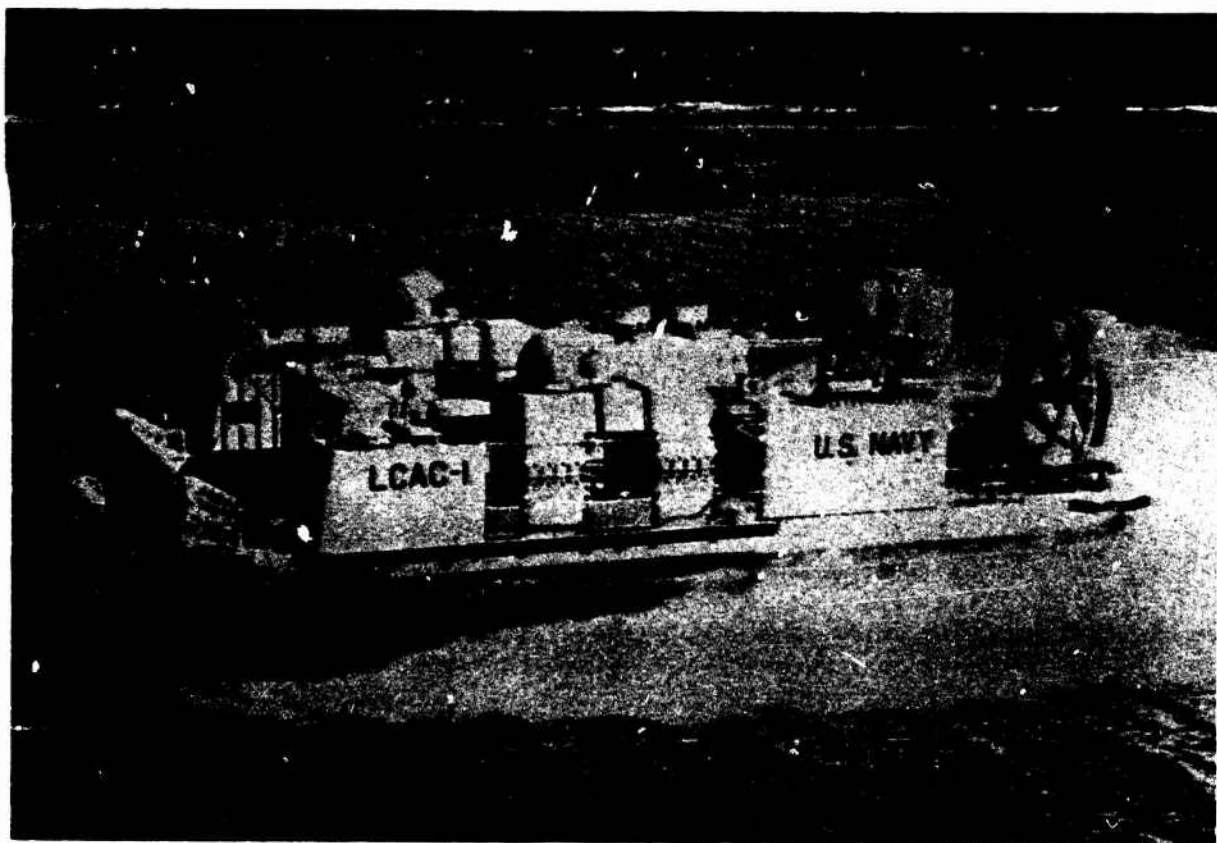
OT&E ISSUES

The major AGM-65F IR MAVERICK IOT&E issues examined during FY86 included evaluation of the system's capability to detect and select specific targets in a multi-ECM environment; the seeker's capability to acquire and lock on targets in realistic operational scenarios; probability of mobility and penetrator/blast kill; warhead lethality and validation of no degradation in previous capability.

OT&E ACTIVITY

During FY86, the initial operational test and evaluation of the AGM-65F was began. The test program, including 100 captive flights and eight missile launches from an A-7E aircraft equipped with a forward looking infrared (FLIR) pod. The purpose of testing is to evaluate the IR MAVERICK weapon system's effectiveness and suitability for combat in both sea and land environments. Six live warhead missiles employing improved fuzes developed under the LASER MAVERICK program and two telemetry missiles will be launched against a variety of sea and land targets at China Lake, California, Point Mugu, California, and other sites. IR countermeasures will be employed, and approximately 40 training missile missions will be flown against a variety of targets in war-at-sea, interdiction and strike scenarios. Testing is scheduled to be completed early in FY87, and the results will be used to support a limited production decision in early FY87.

LANDING CRAFT, AIR CUSHION (LCAC)



SYSTEM DESCRIPTION

LCAC is designed to provide high-speed ship-to-shore transport of all weapon systems and equipment organic to the ground element of a Marine air/ground task force. It has four gas turbine engines, which supply power through eight gearboxes to two lift fans, two bow thrusters, and two controllable pitch propellers. The multiple components of the propulsion system permit continued LCAC operation at reduced capacity/speed in case of equipment casualties or battle damage. With a design speed of over 40 knots and payload of 60 tons, LCAC should provide an over-the-horizon strike capability when operating from a variety of well-deck amphibious ships, including the LSD, LPD, LHA, and LHD. The LSD-41 class ship has facilities which permit organizational level maintenance on the LCAC. LCAC offers unique capabilities allowing it to deliver its payload over the beach under a wide range of tide and weather conditions, providing increased access to the world's littorals.

BACKGROUND

Two phases of LCAC operational testing were conducted during FY86. The second production LCAC was operated during these test periods by Naval personnel of ACU-5 from the USS WHIDBEY ISLAND (LSD-41) and the Naval Coastal Systems Center, Panama City, Florida.

During an operational test period in February 1985 the first production LCAC demonstrated speed and load carrying capability well in excess of required thresholds, but experienced 35 major or critical failures, resulting in its being assessed not operationally suitable. Deficiencies included gearbox failures, drive shaft failures, radar failures, and bow thruster malfunctions. Corrections for these and other failures were engineered and installed in the first two production craft between November 1985 and April 1986. The objective of FY86 testing was to verify that major operational suitability deficiencies identified during this earlier test period had been corrected.

OT&E ISSUES

An examination of OT&E effectiveness and suitability issues continued through FY86. The effectiveness issues examined included speed and load carrying performance, ability to operate with various amphibious support ships, ability to load and offload equipment and cargo for USMC assault forces, ability to conduct coordinated operations with adequate command and control, survivability in high sea states, and vulnerability to light forces ashore. The suitability issues included reliability, maintainability, availability, interoperability, compatibility, logistics supportability, human factors, safety and training.

OT&E ACTIVITY

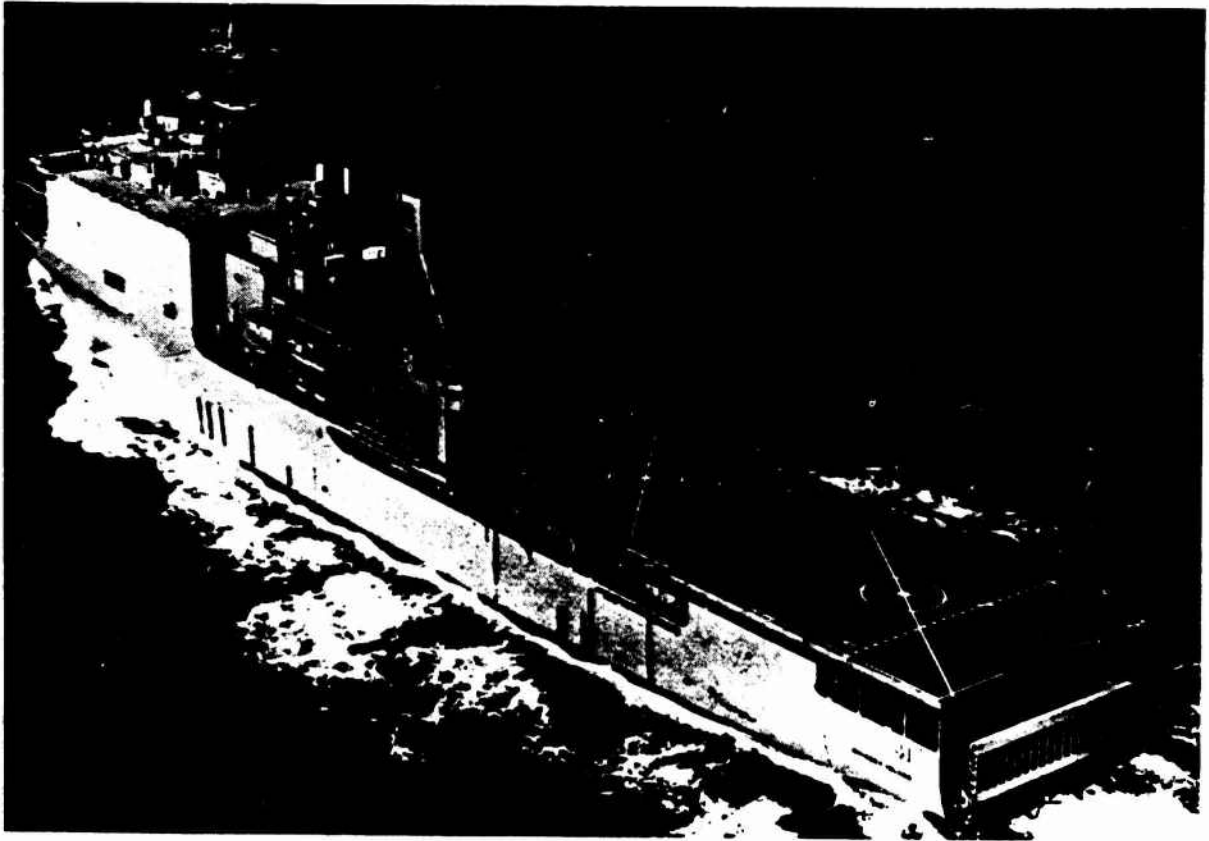
The first FY86 phase of LCAC testing (OT-IIIA2) was conducted 3-9 May 1986. A total of 15 single-LCAC assault scenario missions were conducted in the Gulf of Mexico and ashore on barrier islands adjacent to Elgin AFB, Florida. Assault missions included load-out with USMC equipment aboard USS WHIDBEY ISLAND (LSD-41), a 24 nautical mile transit to the beach and overland movement to a designated unloading area. The objectives were to verify correction of deficiencies identified in OT-IIIA1 and support a limited production decision. Additional testing was recommended.

A second phase of LCAC testing was conducted from 10-20 June 1986, after correction of deficiencies and an intensive period of operations designed to accumulate operating hours on the test craft. Test operations were conducted at the Naval Coastal Systems Center, Panama City, Florida, and the sea islands adjacent to Tyndall AFB, Florida. Ten single-LCAC assault scenario missions were conducted using a specially designed run geometry which duplicated the time, distance and load factors of the basic assault scenario from an amphibious ship stationed 24 nautical miles from the beach. The objectives were to verify correction of deficiencies identified during OT-IIIA2 and support a limited production decision. The results of this phase indicated that LCAC is potentially operationally suitable, and the findings support limited production and limited fleet introduction.

SUMMARY

the effectiveness of multiple LCAC operations and correction of remaining deficiencies will be assessed following OT-IIIB, to be conducted in April 1987 with an LSD-41 class ship and two LCACs. Testing will determine the capability of multiple LCACs to conduct scheduled amphibious assault operations, determine the interoperability with the support ship and verify the correction of deficiencies discovered during OT-IIIA.

LSD-41 AMPHIBIOUS ASSAULT SHIP



SYSTEM DESCRIPTION

The LSD-41 Amphibious Assault Ship is part of the program to provide increased amphibious lift capacity and to operate from over-the-horizon launch points. It should be capable of carrying, launching and supporting four air-cushion landing craft or an equivalent mix of other landing craft. The LSD-41 weapons suite will consist of two PHALANX Close-In Weapon Systems (CIWS), two 20mm guns, the Super Rapid Blooming Offboard Chaff System, and an electronic warfare system. The main propulsion system consists of four high-powered, medium-speed diesel engines driving two controllable pitch propellers.

OT&E ISSUES

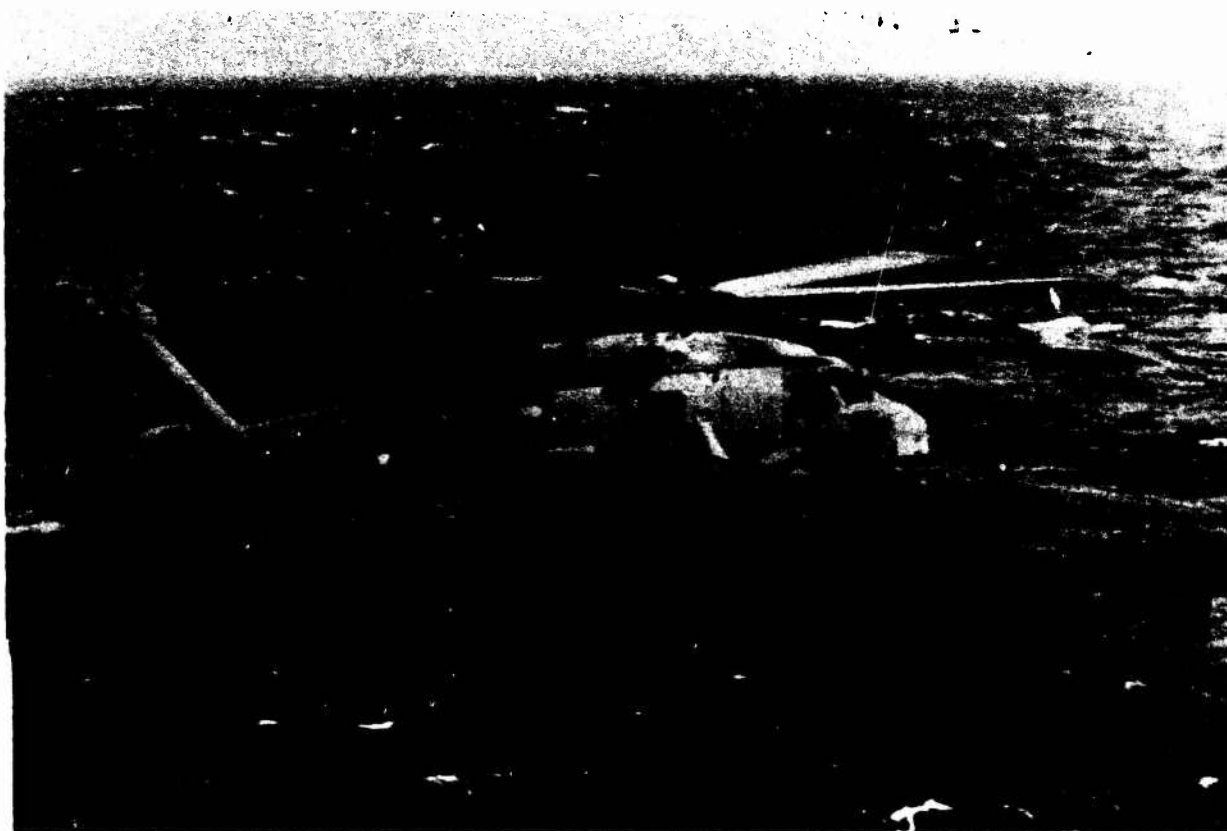
The OT&E issues associated with the LSD-41 class include propulsion system performance, support of the Landing Craft, Air Cushion (LCAC), operation of the bridge crane, and emergency recovery of LCACs, and applicable suitability issues are to be examined. Since the LSD-41 is a repeat design of the LSD-36 class, a full-ship OT&E is not planned. Only the new systems not previously examined form the issues planned for OT&E.

OT&E ACTIVITY

During August-September 1985 operational testing of the LSD-41 was carried out on the first ship of the class, USS WHIDBEY ISLAND (LSD-41). Ten days of operational testing were conducted in conjunction with USS WHIDBEY ISLAND contract trials and development testing of the LCAC. No critical problems were identified with the LSD-41 during this period.

Further operational testing will be conducted aboard LSD-41 at sea concurrently with LCAC OT-IIIB, beginning in April 1987. The scope of testing will focus on the operational effectiveness and suitability of the propulsion and control system, the bridge crane and the LCAC interface. Amphibious operations (ship-to-shore movements) will be conducted. Results of this testing will address the need for any additional FOT&E.

AIRCRAFT CARRIER-INNER ZONE ASW HELICOPTER (SH-60F)



SYSTEM DESCRIPTION

The SH-60F provides a carrier battle group with quick reaction inner-zone antisubmarine warfare (ASW) protection (up to 50 nautical miles) and secondary missions of plane guard, search and rescue, logistics support, MEDEVAC and chaff launching. It replaces the SH-3 helicopter. The SH-60F is a derivative of the SH-60B (LAMPS Mk III) helicopter, using the SH-60B airframe and drive train and replacing mission avionics designed for outer-zone ASW with those designed for inner-zone ASW. This includes adding the AQS-13F active dipping sonar which will operate deeper, have a greater source level, a higher figure of merit (FOM), and a faster reeling machine than its predecessor. The combination of greater depth and higher FOM will increase the average area searched per dip. A new avionics architecture, based on the existing ASN-123 mission computer and a data bus, will be developed for the SH-60F. Automatic flight control system (AFCS) modifications will be incorporated to tailor the automatic approach, departure and hover capabilities to inner-zone mission requirements. An internal auxiliary fuel system will give the SH-60F additional endurance, and a third weapons station will be added on a port side stub wing so that two Mk-50 torpedoes can be carried along with an external fuel tank.

BACKGROUND

The SH-60F was approved as a new start in FY82 and entered full-scale engineering development in February 1985. The AQS-13F sonar initially underwent separate development as an improvement to the existing AQS-13E sonar and has been converted to SH-60F contractor furnished equipment for completion of development. FY86 OT&E was planned to support the low-rate initial production (LRIP) decision in FY87. The full production decision will be made after the operational evaluation (OPEVAL) scheduled for early FY88.

OT&E ISSUES

Issues planned for examination during FY86 OT&E include in-flight refueling from ships, effectiveness of AQS-13F sonar modes, vulnerability of the SH-60F and all suitability issues.

OT&E ASSESSMENT

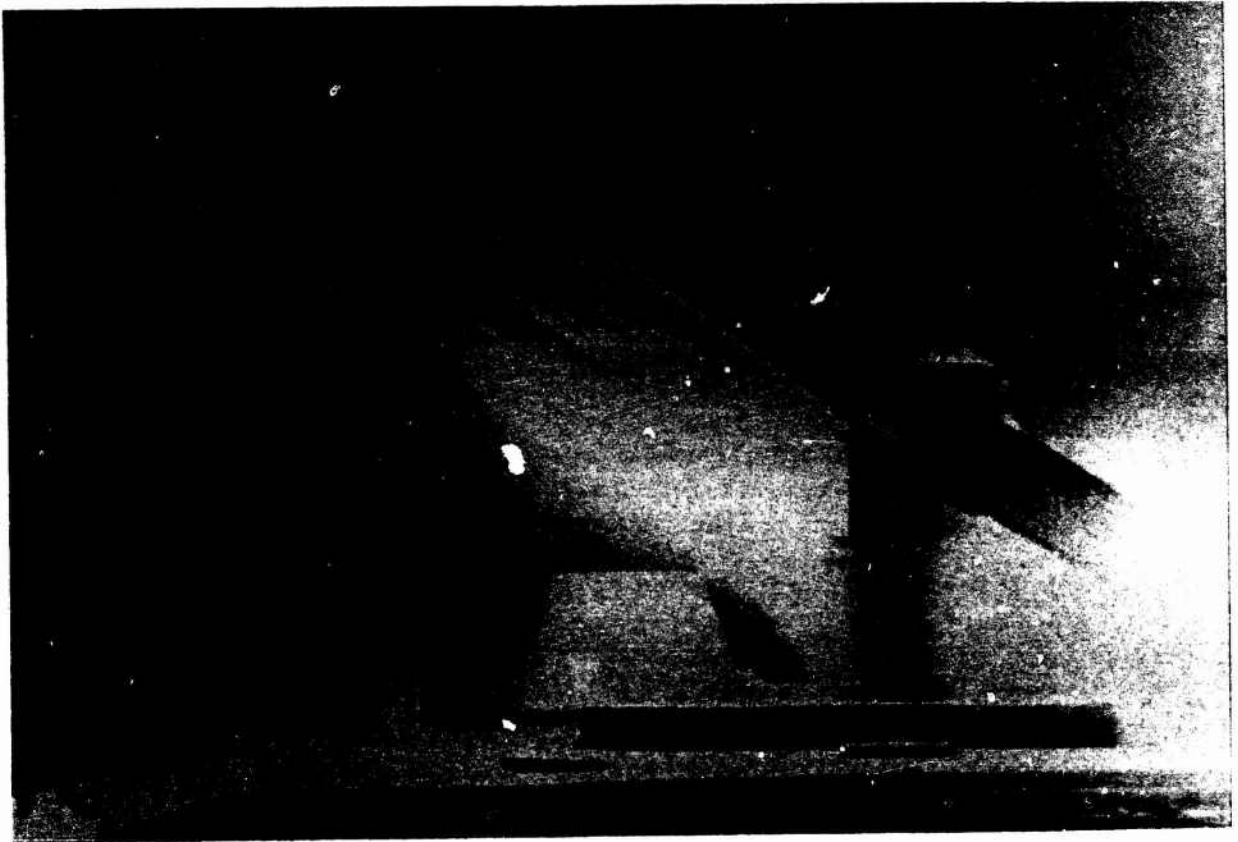
No SH-60Fs have been delivered, so early OT&E was conducted using a modified SH-60B (SH-60B (MOD)). Most of the LAMPS Mk III equipment was removed and an engineering development model of the AQS-13F sonar, a modified automatic flight control system (AFCS), an improved durability gear box, and an additional hydraulic pump for the sonar hoist were installed to provide the test platform. Because the SH-60B (MOD) was susceptible to electromagnetic interference no shipboard operations or in-flight refueling could be conducted. The SH-60B MOD did not have a tactical navigation system or sonobuoy processor and was restricted to flying ASW dipping missions during day visual meteorological conditions. Operations were conducted against a submarine at the Atlantic Undersea Test and Evaluation Center (AUTEC).

The OT&E identified a number of specific deficiencies in human factors and safety, but the other suitability issues of logistics supportability, compatibility, interoperability and documentation were unresolved due to the early stage of development.

SUMMARY

The OT&E concluded that the CV Inner-Zone ASW Helicopter had the potential to be operationally effective and suitable, and the results supported continued development.

STANDARD MISSILE-2 BLOCK II (SM-2)



SYSTEM DESCRIPTION

The SM-2 Block II is a solid-propellant-fueled, tail-controlled surface-to-air and surface-to-surface missile. It was designed to counter high-speed, high-altitude antiship missiles in an advanced electronic countermeasures environment. There are four versions of this missile; three medium-range (MR) rounds (for the AEGIS Mk-26 guided missile launching system, the AEGIS vertical launching system, and the TARTAR new threat upgrade system) and one extended-range (ER) round (for the TERRIER new threat upgrade system). Block II improvements include a new signal processor to provide less vulnerability to electronic countermeasures, improved fuze and focused-blast fragment warhead to provide better kill probability against smaller, harder targets, and new propulsion for higher velocities and maneuverability. Component commonality is maximized among the various SM-2 Block II versions.

BACKGROUND

The SM-2 Block II began development in 1976 and began production in 1982 (ER) and 1983 (MR). The operational evaluations of these missiles were conducted during FY83 (ER) and FY84 (MR). Follow-on OT&E (FOT&E) was conducted on the SM-2 Block II (ER) in FY85. The results of these tests were sufficiently positive for DOT&E in March 1985 to submit to the Committees on Armed Services and on Appropriations of the Senate and House of Representatives, the report required when a weapon system's production rate is to be increased (above the low-rate initial production rate). Follow-on OT&E is continuing to examine issues not resolved during earlier testing, correction of deficiencies and system improvements.

OT&E ISSUES

The primary OT&E issue examined during FY86 testing was the operational effectiveness of the SM-2 Block II MR against very-high-altitude, sea-skimmer, self-screening-jammer and forward-firing chaff targets. Other OT&E issues included operational effectiveness of the AEGIS weapon system with the SM-2 Block II MR, the capability of the AEGIS weapon system to support SM-1 Block VI engagements, the antisurface warfare capability of SM-2 Block II MR, and the survivability, vulnerability and suitability of SM-2 Block II.

OT&E ASSESSMENT

FY86 OT&E consisted of two multiple-target and nine single-target raids against USS VINCENNES (CG-49). The target drones simulated antiship missiles and manned aircraft threats. Eleven SM-2 Block II MR missiles and one SM-1 Block VI missile were launched by VINCENNES during these raids. The OT&E was limited by target reliability problems. Other test limitations precluded a complete assessment of all suitability issues.

SUMMARY

The SM-2 Block II is continuing to undergo realistic follow-on OT&E to examine OT&E issues not resolved earlier. Because of target drone failures, additional testing is required. Although some OT&E issues still exist, the SM-2 Block II MR demonstrates satisfactory operational effectiveness and suitability.

S3 WEAPON SYSTEM IMPROVEMENT PROGRAM (WSIP)



SYSTEM DESCRIPTION

The S-3A WSIP is designed to upgrade the carrier-based S-3 weapon system to better perform the sea control mission against more capable threats. The new system, designated S-3B, includes a new acoustic processor, a 99-channel sonobuoy receiver and a new acoustic tape recorder for improved anti-submarine warfare (ASW) capability in the outer ASW zone. The radar system was re-designed to provide an inverse synthetic aperture radar (ISAR) capability, enabling classification of surface ships. The electronic warfare support measures (ESM) system was modified to increase its ability to detect and classify threat emitters. The improved acoustics, ISAR, and modified ESM provide a more capable surface, subsurface, surveillance coordination (SSSC) capability which, when combined with the HARPOON added as part of the WSIP, provides the S-3B with stand-off surface attack capability. The S-3B was also provided with a defensive capability through the addition of electronic countermeasures (ECM) dispensers for chaff, flares, and jammers. The future command and control capability of S-3B will be further enhanced through the WSIP space and weight reservations for the global positioning system (GPS) and joint tactical information distribution system (JTIDS).

OT&E BACKGROUND

During FY85 the S-3B underwent operational testing (OT-IIA) to assess potential operational effectiveness and suitability. In FY86, OT-IIB was initiated to determine the operational effectiveness and operational suitability of the S-3B, to verify the correction of deficiencies noted from prior testing, to continue tactics development and to support a recommendation regarding full fleet introduction.

OT&E ACTIVITY

OT-IIB operational testing of the S-3B began in June 1986 using the two full-scope engineering development aircraft. AIRTEVRON ONE (VX-1) flew a total of 175.2 flight hours in evaluating the S-3B performance. As a result of deficiencies identified in the system software and the maintainability of the aircraft which rendered the S-3B system not sufficiently operationally suitable to support testing, Commander, Operational Test and Evaluation Force (COMOPTEVFOR) placed the S-3B in deficiency status on 19 September 1986. During subsequent deficiency debriefs by VX-1, several subsystems were described as having excellent performance (radar, ECM, and HARPOON) during the test operations. The acoustic subsystem and the general integration effort were considered to have excellent performance potential after resolution of the suitability issues.

SUMMARY

The S-3B was placed in deficiency status by COMOPTEVFOR in late FY86. COMOPTEVFOR is providing data pertaining to the system deficiencies, and a corrective action plan is being prepared by the Naval Air Systems Command. COMOPTEVFOR representatives, during deficiency debriefs, described the radar, HARPOON and ECM subsystems as having excellent performance during testing. In addition, the acoustic subsystem and the system integration demonstrated excellent performance potential. COMOPTEVFOR will resume testing in FY87 following correction of the identified deficiencies and recertification that the S-3B is ready for operational testing.

TOMAHAWK WEAPON SYSTEM



SYSTEM DESCRIPTION

The TOMAHAWK weapon system is a long-range cruise missile system designed to be launched from submarines and surface ships against land targets and ships. There are four missile variants, antiship (TASH), nuclear land attack (TLAM-N), conventional land attack (TLAM-C), and the conventional land attack, submunition (TLAM-D). Each is contained within a pressurized cannister to form an all-up-round. The submarine all-up-round is launched from a torpedo tube, and the surface ship all-up-round is launched from an armored box launcher or the vertical launching system (VLS) Mk-41. Both submarine and surface ships have combat/weapon control systems to perform engagement planning, missile initialization and launch control functions. Targeting for TOMAHAWK is supported by the Theater Mission Planning System, which provides the land targets and overland missile navigation update information, and the Over-the-Horizon Detection, Classification, and Targeting System, which provides ship targets and contact avoidance information.

BACKGROUND

Development of the sea-launched cruise missile began in 1972 with full-scale engineering development starting in 1977. Initial operational test and evaluation (IOT&E) began in January 1981. OT&E of each TOMAHAWK missile variant and the various associated weapons systems has been preceded by a combined developmental test/operational test to minimize the expenditure of test resources while achieving both technical and operational test objectives. OT&E of the TASM and TLAM-N missile variants from both submarines and surface ships was sufficiently complete in 1984 that in November 1984 the Director, Operational Test and Evaluation was able to submit to the Committees on Armed Services and on Appropriations of the Senate and House of Representatives, the report required by 10 U.S.C. 138. This report supported the decision to increase the production rates of TASM and TLAM-N beyond the low-rate initial production (LRIP) level. A report for TLAM-C was submitted by the DOT&E in December 1985. OT&E of new missile variants, missile improvements and new launching and weapon control systems is a continuing process.

OT&E ISSUES

Two separate TOMAHAWK operational tests were completed during FY86. The first was the operational evaluation (OPEVAL) of the TOMAHAWK ship vertically launched cruise missile weapon system Mk-37 which includes the AN/SWG-3 weapon control system (WCS) and vertical launching system (VLS) Mk-41. This OPEVAL examined the full range of missile and ship operational effectiveness and suitability issues including external command, control, communications and intelligence (C3I).

The second operational test examined product improvements of the TASM variant as well as the full range of ship, submarine and missile operational effectiveness and suitability.

OT&E ASSESSMENT

Operational testing of the vertically launched TOMAHAWK consisted of three actual (one TASM, one TLAM-N, and one TLAM-C) and 49 simulated missile launches from the USS NORTON SOUND (AUM-1). Normal tactical communications circuit data was incorporated into the scenarios and provided to the launch platform as it would have been received tactically. USCINCLANT and the Theatre Mission Planning Center also participated in the weaponeering and planning and production of TLAM target packages. The test was limited by NORTON SOUND not being fully representative of the ship classes for which TOMAHAWK is intended, the use of simulated vice actual salvo firings, no assessment of missile survivability or vulnerability, environmental conditions experienced in southern California operating areas, inability to evaluate storage reliability and only three test flights for comparison to criteria.

The follow-on operational test and evaluation (FOT&E) of the TASM improvements consisted of five TASM launches from three submarine and two surface ships. Two of the launches were conducted as combined developmental tests/operational tests, and one of the firings included a live warhead. Test limitations precluded evaluation of storage reliability and, due to the small number of shots, a comparison of missile performance to criteria.

OT&E SUMMARY

FY86 TOMAHAWK testing was conducted in a realistic operational environment satisfactory for resolution of the primary OT&E issues. The TOMAHAWK vertical launch cruise missile weapon system Mk-37 demonstrated sufficient operational effectiveness and suitability during OT&E to support limited production with deficiencies identified for correction and retest during the next planned phase of OT&E. The operational effectiveness and suitability of the TASM improvements warranted a recommendation to incorporate them. The TOMAHAWK FOT&E program will continue to examine correction of deficiencies as well as incorporation of new launch platforms and product improvements.

OT&E SUMMARY

FY86 TOMAHAWK testing was conducted in a realistic operational environment satisfactory for resolution of the primary OT&E issues. The TOMAHAWK vertical launch cruise missile weapon system Mk-37 demonstrated sufficient operational effectiveness and suitability during OT&E to support limited production with deficiencies identified for correction and retest during the next planned phase of OT&E. The operational effectiveness and suitability of the TASM improvements warranted a recommendation to incorporate them. The TOMAHAWK FOT&E program will continue to examine correction of deficiencies as well as incorporation of new launch platforms and product improvements.

BACKGROUND

OT&E of the TRIDENT CCS began in 1978 at the Land Based Evaluation Facility (LBEP), Naval Underwater Systems Center, Newport, Rhode Island. Numerous deficiencies were identified. Deficiency corrections and system improvements were made, and several additional phases of OT&E were conducted at LBEP through 1982. The new TRIDENT life support systems first underwent OT&E at the Naval Ship Engineering Center, Philadelphia Division in 1977. The first at-sea OT&E of the above systems took place in 1983 in USS OHIO (SSBN 726), the first ship of the class.

OT&E ISSUES

Two separate phases of OT&E were conducted during FY86. The first OT&E was conducted on a new software program for the TRIDENT CCS. The OT&E issues were the new programs ability to support CCS functions necessary to the ship's mission, processing operational data in correct priority, correction of previous deficiencies and no degradation of previous CCS performance. All suitability issues were also examined.

OT&E was also conducted on the BQQ-6 sonar. The primary OT&E issue was the BQQ-6's ability to detect, classify and track, actively and passively, surfaced and submerged contacts. Other issues included mine avoidance, torpedo evasion, support of torpedo attack, support of command decision making, survivability, vulnerability and a full range of suitability issues.

OT&E ASSESSMENT

OT&E of the TRIDENT CCS software program revision was conducted during an SSBN strategic deterrent patrol and two Mk-48 torpedo proficiency exercises. There were no test limitations. With two exceptions, all OT&E issues were satisfactorily resolved and all suitability criteria were met.

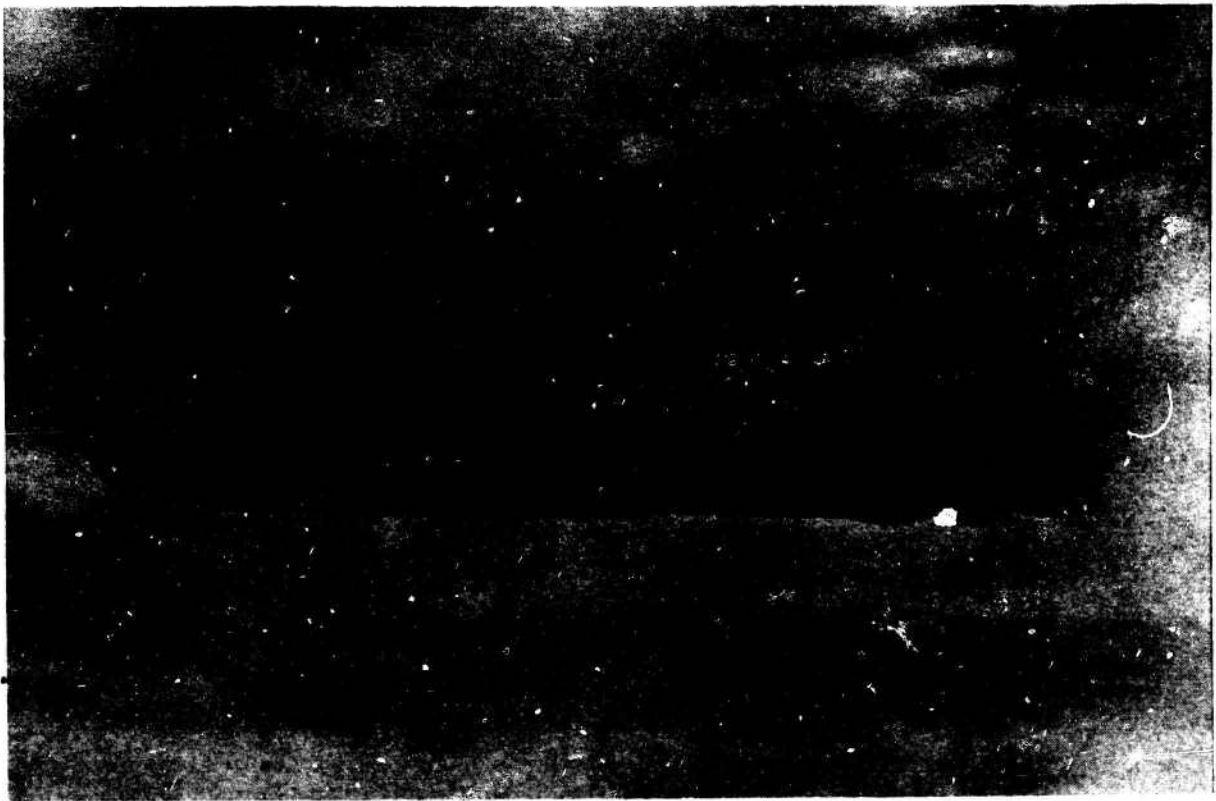
OT&E of the BQQ-6 sonar was conducted in an SSBN during 19 open-ocean anti-submarine warfare scenarios against an SSN. The environmental conditions experienced in the test area limited target detections to 5,000 to 8,000 yards regardless of sonar performance, and therefore, test results were not comparable to criteria. The limited availability of test ship time precluded the assessment of mine avoidance, torpedo attacks, active detection and intercept and system reliability and maintainability. There were no hardware or software failures during the 148 hours of operations, and there were no survivability, vulnerability or suitability deficiencies noted.

SUMMARY

The OT&E concluded that the TRIDENT CCS software revision was potentially operationally effective and operationally suitable and recommended correcting deficiencies. Because of the test limitations no conclusions regarding BQQ-6 sonar operational effectiveness and suitability could be made. Additional follow-on OT&E will be scheduled to assess the outstanding OT&E issues.

PART V
AIR FORCE OT&E

AIR LAUNCHED CRUISE MISSILE (ALCM)



SYSTEM DESCRIPTION

The ALCM is an air-to-ground subsonic missile designed for launch with a nuclear warhead from the B-52 aircraft. The missile is powered by a small turbofan engine in the 600-pound thrust category. Missile navigation is accomplished by an inertial navigation system augmented by a terrain correlation (TERCOM) technique using digital terrain mapping. It is capable of flying mid-altitude, cruise, and low-altitude terrain following (TF) missions. The ALCM will fly programmed flight paths at commanded flight modes, speeds and altitudes. At present the B-52 can carry 12 ALCMs externally, with six on each of two wing pylons. Future plans call for the additional capability of eight internal ALCMs on a rotary launcher.

BACKGROUND

The program was initiated by a Defense System Acquisition Review Council (DSARC I) in February 1974, with a DSARC III production decision for the ALCM (AGM 86B) in April 1980. Initial operational capability with the first operational B-52G squadron at Griffiss AFB, New York, was declared in December 1982. A requirement for more realistic operational testing during the follow-on operational test and evaluation (FOT&E) conducted by the Strategic Air Command (SAC) drove the need for a Canadian-U.S. (CANUS) agreement for operational testing over the more operationally representative Canadian terrain. The first ALCM test launches over Canada were completed on 19 and 25 February 1985. SAC's FOT&E program will continue for the life of the missile.

OT&E ISSUES

Critical operational issues include terminal accuracy, terrain following, mission reliability, survivability, and mission planning. These are evaluated through the objectives of SAC's ACM FOT&E program (global cruise). Specific test objectives are designed to 1) provide inputs to SAC planners in determining weapon system accuracy and reliability; 2) verify current operational employment concepts, tactics and techniques, and identify operational deficiencies; 3) verify adequacy of technical data and equipment used in maintenance, check-out, and operation of the weapon system--to include aircrew, software, hardware and the mission planning system; 4) evaluate performance of the weapon system--to include aircrew, software, hardware, and the mission planning system; and 5) continue evaluation of those areas recommended as a result of previous testing.

OT&E ACTIVITY

ALCM testing continues to test the weapon system in the most operationally realistic environment possible. Testing is managed by the Strategic Air Command (HQ SAC/DOJ) and conducted by the 49th Test Squadron. Present test limitations, as with similar cruise missiles, are airspace constraints, weather criteria, range availability, and terrain diversity. Missions over the Canadian test route significantly increase the realism with regard to the type of terrain overflown during ALCM testing. During FY86, seven ALCM missiles were launched B-52 aircraft. Of these, three failures were experienced prior to reaching the designated target. Four missiles completed the planned flight profile to their designated targets, and one of those experienced fuel depletion prior to the planned recover point.

OT&E ASSESSMENT

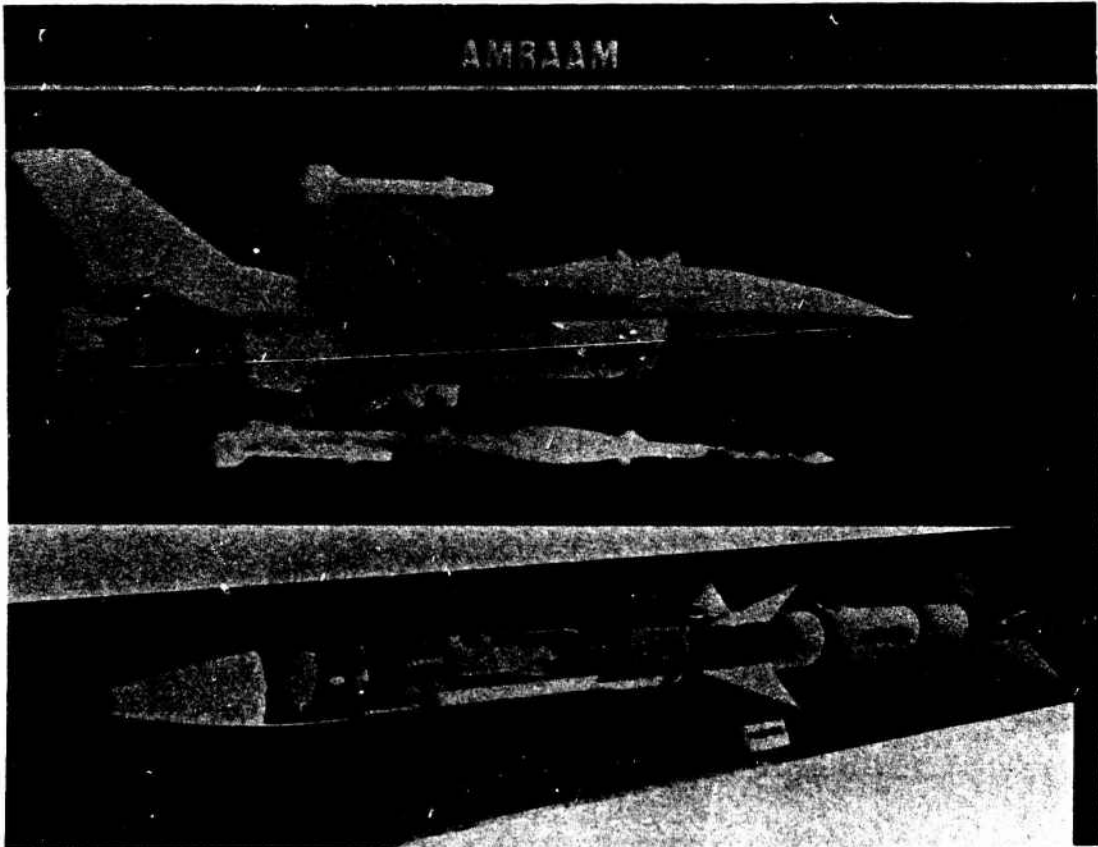
The ALCM FOT&E exercises the weapon system in its operational configuration, environment and employment modes to the maximum extent possible. This is accomplished by: randomly selecting all test assets; using operations and maintenance personnel from the tactical unit to posture, maintain and launch the aircraft/missile; using approved technical data, checklists and tactical procedures to the extent possible; and insuring weapon system changes for instrumentation, range and nuclear safety are held to a minimum. The prime figure of merit used to assess ALCM capability is weapon system reliability (WSR), which is modeled as the product of the individual reliability of

aircraft systems release systems, captive flight, free flight, and warhead. Currently, the cumulative WSR for the ALCM system is estimated at 0.75, and the average accuracy (circular error probable) is 139 feet.

SUMMARY

Deliveries of the ALCM through FY86 bring the total missiles delivered to 1,715. Testing during the past year highlighted several difficulties which have been resolved. Discovery of the causes of the unplanned flight terminations has enabled SAC to ensure this weapon system continues to meet all mission requirements.

AMRAAM (AIM-120A)



SYSTEM DESCRIPTION

The Advanced Medium Range Air-to-Air Missile (AMRAAM) program provides for the acquisition of the next generation all-weather, all-environment medium range air-to-air missile system in response to USAF, USN and NATO operational requirements in the 1989-2005 time period. The system is designed so that AMRAAM can be employed within and beyond visual range, and compared to the existing AIM-7 SPARROW which it replaces, AMRAAM design features provide increased firepower and combat utility/effectiveness while significantly reducing aircraft/aircrew vulnerability. Increased average velocity provides the capability to outshoot threat aircraft by increasing the separation between the launch aircraft and the target at AMRAAM intercept. Reduced miss distance, improved fusing and increased warhead lethality combine to greatly enhance missile lethality. The active radar seeker provides a launch-and-maneuver capability for increased survivability and multiple target engagement on a single intercept. Improved clutter rejection and inherent ECCM capability enhance the missile's performance at low altitudes and in a countermeasure environment. Improved system reliability, maintainability and logistic supportability increase overall operational availability and effectiveness.

BACKGROUND

The AMRAAM program responds to a 1978 Joint Operational Requirement. In-depth full-scale development was initiated in December 1981, with a follower contractor selected in July 1982. Schedule delays and costs caused program slowdown. OSD directed investigation of alternative methods for reducing AMRAAM costs in January 1985. In June 1985 the Secretary of Defense approved a revised program which incorporated cost reduction measures and set cost caps. The FY86 Defense Authorization Bill required certification of a production program at \$7.0 billion (\$5.2 billion, Air Force; \$1.8 billion, Navy) and a full scale development contract limit of \$556 million. The development test program has accomplished 16 firings through FY86, with three failures and one no-test. It should be noted that some test objectives were accomplished on all firings.

OT&E ACTIVITY

FY86 initial operational test and evaluation of AMRAAM began in October 1985 with the start of the Captive Carry Reliability Program (CCRP). The CCRP will provide reliability and maintainability data for the AMRAAM and the associated carrying and launching equipment such as the modular rail launcher (MRL), which is designed for use on the F-15, F-16, F/A-18, and F-14. The MRL replaces the launcher currently used for the AIM-9 series heat-seeker missile and is compatible with both the AIM-9 and AMRAAM. CCRP is a combined DT&E/IOT&E effort, and the program to date has involved captive carriage of AIM-9 and AMRAAM missiles on the F-16 MRL at Nellis AFB, Nevada, and Luke AFB, Arizona. The reliability of the AMRAAM built-in-test (BIT) is one of the primary objectives of the CCRP, therefore these aircraft are AMRAAM BIT capable. The test team plans to accumulate 800 hours of captive carriage time on AMRAAM vehicles and 500 hours on the AIM-9 missile during the second phase of CCRP. IOT&E missions with AMRAAM captive equipment live firings will begin in FY87.

AN/ALQ-131(V)



SYSTEM DESCRIPTION

The ALQ-131 Block II pod is an airborne self-protection electronic countermeasures (ECM) pod designed to protect tactical aircraft against a wide variety of radar threats. The pod is modularly constructed to provide for easy maintenance. The Block II pod adds capability for countering the current threat radar systems. Additional memory and a new microprocessor-controlled waveform generator were added to give the Block II pod wider parameter ranges as well as better stability and resolution needed to counter newer threats.

BACKGROUND

The ALQ-131 ECM set is a tactical pod designed for use on high-performance aircraft. The Block I pod was designed in 1972. Block II is a major module update that evolved from tactical requirements for improved techniques to be used against advanced threat radars. A receiver/processor is in limited production and will be incorporated in the Block II pod to further enhance the pod capability to counter new threats.

OT&E ISSUES

Critical operational issues include:

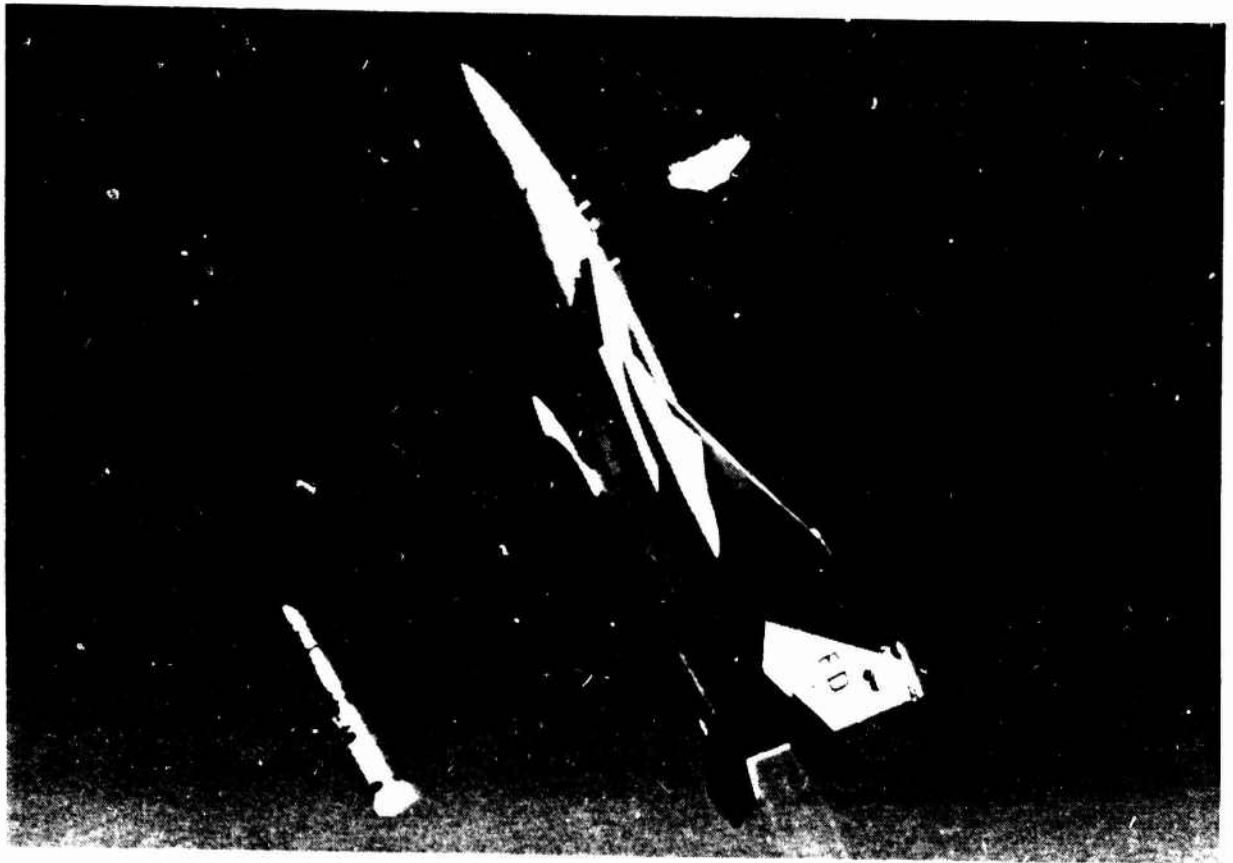
- (a) Evaluating the capability of the ALQ-131 Block II pod to provide tactical aircraft self-protection;
- (b) Assessing the effects of maneuvers and flight profiles on system effectiveness;
- (c) Assessing the electromagnetic interference (EMI) and electromagnetic compatibility (EMC) between the pod, other on-board avionics, weapon systems and tactical formations;
- (d) Assessing reliability;
- (e) Assessing maintainability in operational environment using contractor maintenance equipment; and
- (f) Evaluating operational reprogrammability and software maintainability.

OT&E ACTIVITY

The Air Force Electronic Warfare Evaluation Simulator (AFEWES) portion of the Block II QOT&E has been completed. The results of the AFEWES testing show that the Block II POD performs as expected and has the potential to meet the effectiveness requirements necessary for operation in the 1990s and beyond.

QOT&E flight testing began in mid-July 1986. The QOT&E is 25% complete, with 30 out of 40 scheduled sorties having been flown to date. High-altitude technique optimization is complete, and U.S. Air Force Tactical Air Weapons Center (USAF TAWC) personnel are now conducting flight missions to determine high-altitude effectiveness. The same procedure will be followed to determine low-altitude effectiveness. Supportability data will be collected throughout the test.

ANTI-SATELLITE WEAPON SYSTEM (ASAT)



SYSTEM DESCRIPTION

The air-launched ASAT missile system, currently under development, has two elements, the missile and the carrier aircraft equipment (modified F-15). The first stage of the missile is a modified Short Range Attack Missile (SRAM). The second stage uses an ALTair motor for propulsion and contains the reaction control system for altitude control. The second stage also contains the missile guidance assembly, a cryogenic system, and the miniature vehicle (MV) dispenser. The MV, carried in the second stage, is the terminal warhead of the missile and is designed for hypervelocity-impact kill. Surveillance and targeting data will be provided by the existing Space Detection and Tracking System (SPADATS). A command and control system to generate mission profiles and direct the intercept missions will be provided by a mission control center to be located in the Cheyenne Mountain Complex. To support ASAT testing, a dedicated target satellite called an instrumented test vehicle (ITV) was also developed.

BACKGROUND

This program develops and tests an anti-satellite system in response to National Space Policy guidance and the Secretary of Defense approved Mission Element Need Statement. Combined developmental and operational test and evaluation (DT&E/IOT&E) began in late 1983 at Edwards AFB, California, with Air Force Flight Test Center and Air Force Operational Test and Evaluation Center (AFOTEC) teams performing joint DT&E/IOT&E activities. The Air Force planned 12 flights from May 1983 through July 1985. However, program turbulence and congressional limitations restricting the number of test launches dictated that the schedule be revised.

OT&E ISSUES

Critical operational issues are 1) availability of accuracy and timely targeting data from the SPADATS network to the aircraft/missile; 2) capability to configure sufficient F-15 aircraft to support mission requirements; 3) aircraft capability to deliver the missile to a launch volume within specified ASAT launch constraints; 4) missile capability to deliver the miniature vehicle to a volume in space to enable acquisition and intercept of the target; and 5) miniature vehicle capability to detect, acquire, intercept, and negate the specified target.

OT&E ACTIVITY

The congressional moratorium on intercepts of objects in space limited FY86 ASAT activity to ground demonstrations, captive-carry flights, and live-fire missions aimed only at the radiant energy of a star (infrared probe missions--IRPs). The first, an IRP at a medium altitude trajectory, was successfully launched on 22 August 1986. The second, an IRP at a low altitude trajectory was successfully launched on 30 September 1986. The moratorium precluded use of the two test satellite, called an instrumented test vehicle (ITV), launched in December 1985, which remains in orbit. Two ASAT command, control and communications (C3) ground demonstrations were completed on 27 May and 23 September 1986. These provided information which will improve the future effectiveness of the ASAT C3 system. There were nine captive carry flights during FY86. The primary areas investigated were F-15 supersonic launch capability with fleet representative engine trim (96%) and uptrimmed engine (102%), inflight procedures for the pilot's manual update of the ASAT missile launch time, and several other objectives, including navigation performance tests. Since over half of the IOT&E objectives require live-launches against actual targets, the moratorium is significantly limiting needed testing.

B-1B STRATEGIC BOMBER



SYSTEM DESCRIPTION

The B-1B is a strategic multirole weapon system designed to conduct manned bomber operations throughout the spectrum of confrontation and conflict from normal peacetime through contingencies to general war. It is designed to deliver conventional and nuclear gravity bombs as well as serve as a cruise missile launch platform. The primary role of this aircraft is as a strategic-attack penetrator. It is designed to take maximum advantage of the combined effects of low altitude, high speed, reduced radar cross section, high clutter, and sophisticated ECM to provide for its need to penetrate and survive. This long-range combat aircraft embodies advances in aeronautical and counter-measures technology to enhance survivability in a projected high-threat environment.

BACKGROUND

The Defense System Acquisition Review Council Process was completed for the B-1B in December 1976. Production and deployment were cancelled in June 1977. Subsequently, in July 1980, the Department of Defense was directed to vigorously pursue the full-scale engineering development of a multirole bomber to achieve an initial operational capability (IOC) not later than FY87. The B-1B test program, with the Air Force as the integrator of the systems, is designed to take advantage of applicable B-1A test data. Design and testing which were not completed at the time of the 1977 cancellation include dynamic response, aircraft structures testing, flying qualities at low speeds and in engine-out conditions, all-weather/adverse-weather operations, diagnostic tests, electronic countermeasures, weapons delivery and weapons accuracy testing. Capability for conventional weapons (Mk-56 and Mk-82) is planned for March 1987. Combined DT&E/IOT&E flight testing began with the initial flight of B-1A number 2, and flight test will continue through April 1988.

OT&E ISSUES

In April 1985, the B-1B commenced a combined DT&E/IOT&E and FOT&E. IOT&E evaluation of operational effectiveness and suitability, includes prior B-1A deficiencies. Those deficiencies involved auxiliary power unit (APU), flat/slat, hinge movement, weapon-bay acoustics, SRAM/weapon mechanization, fuel center of gravity (CG) management system, fuel leaks, flight-control rigging, diagnostics/central integrated test set, defense system capability, and subsystem supportability. At a minimum, the IOT&E phase is to evaluate: navigation reliability and accuracy; low-level penetration capability utilizing terrain following radar and terrain avoidance avionics; the defensive avionics system's ability to detect, identify, and effectively counter multiple threats in all quadrants; tail warning function (TWF) ability to detect, display and provide expendables (chaff/flare) pulse for airborne interceptors (AIs) and air-to-air missiles; the delivery of dissimilar weapons on multiple targets; critical hardware and software deficiencies; and diagnostics.

OT&E ACTIVITY

The IOT&E portion of the combined DT&E/IOT&E began 31 July 1984 at Edwards AFB, California. As a result of delays in hardware and software development IOT&E has progressed slowly and is largely yet to be accomplished. Aircraft functions have been individually tested rather than operationally evaluated as an integrated system. Different system configurations on each aircraft limit the type of testing which can be performed with each test bed. B-1A number 4 has flown 94 developmental/operational sorties during the current program. Activities on this aircraft have emphasized critical operational features such as the offensive avionics system including automatic terrain following, high resolution ground map function of the offensive radar system, and air alignment. Defensive testing has worked bands 2-7 against multiple threats on several ranges. B-1B number 1, the first production aircraft, was delivered to Edwards AFB on 31 October 1984 and has flown 65 sorties. Those were used primarily to clear weapons delivery envelopes, demonstrate handling qualities, and included some offensive and defensive avionics testing. B-1B number 9,

the first B-1B capable of heavyweight, cruise missile and common strategic rotary launcher (CSRL) activities arrived at Edwards in March 1986. It has flown 10 sorties, concentrating on performance and weapons testing. FOT&E effectiveness testing started at IOC, which was declared on 1 October 1986.

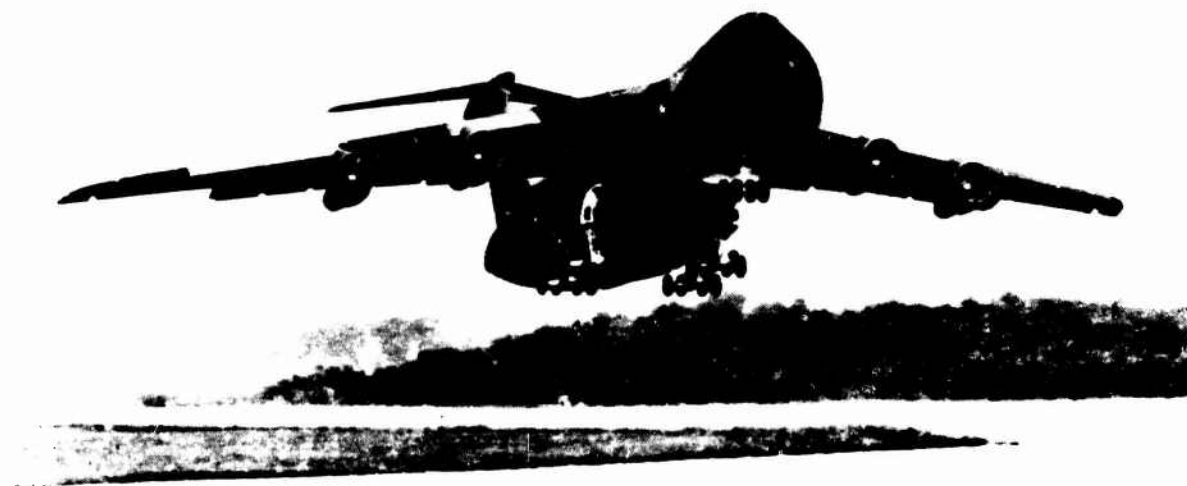
OT&E ASSESSMENT

Successful accomplishment of the IOT&E portion of B-1B testing has thus far been precluded by delayed development and maturation of B-1B systems.

SUMMARY

The B-1B program is unique in that system development, DT&E, IOT&E, FOT&E and production are concurrent events. This concurrency necessitates a piggy-backing of OT&E test objectives on DT&E missions. However, many developmental problems have to be corrected before meaningful OT&E data can be collected. As a result, the majority of OT&E testing is delayed until after IOC. After the additional development required for defensive systems, flight controls and weapons, it is expected that the B-1B will meet/exceed original requirements.

C-5B AIRCRAFT



SYSTEM DESCRIPTION

The C-5B is essentially a modified C-5A aircraft with many subsystems upgraded to take advantage of technological advances. With few exceptions, the major components and systems incorporated in the C-5B are the same as those currently in use on the post-wing-mod C-5A. Improvements were incorporated to correct problems discovered in the C-5A since its introduction into the Air Force inventory. These changes include improved corrosion protection and hydraulic subsystems; upgraded avionics, flight controls, and the malfunction detection and analysis and recording system; and incorporate the latest engine configuration. System characteristics and performance will be virtually the same as the C-5A, with a maximum allowable cabin load of 261,000 pounds, critical field length of 10,400 feet, and an unrefueled range of 2,850 nautical miles.

BACKGROUND

The November 1980 C-X Mission Element Need Statement (MENS) and the April 1981 Congressionally Mandated Mobility Study (CMMS) established the need for additional airlift capability beyond that currently available. A Secretary of Defense decision during the FY83 budget review placed increased emphasis on near-term improvement in inter-theater airlift capability and directed funding for 50 C-5B airlift aircraft. The C-5B is a unique program in that it was a sole-source, firm-fixed price acquisition of a system that had been out of production for a considerable period of time. The basic program philosophy is that the first production C-5B was the 82nd aircraft off a production line which had been closed since 1972. The production contract was awarded in December 1982 and the first C-5B flight occurred in September 1985. Delivery of the 16th aircraft is scheduled for June 1987, with the 50th aircraft to be delivered in March 1989.

OT&E ISSUES

The critical issues addressed the possible problems of restarting an assembly line that has been idle for over 10 years. The objective of the qualification testing (QOT&E), conducted by the Military Airlift Command (MAC), was to evaluate the impact of new/modified subsystems components (including items supplied by new vendors) on C-5B operational effectiveness and suitability. The primary operational issues for this program are: 1) Will the C-5B perform the strategic airlift mission equally as well as the C-5A? 2) Have reliability and maintainability been improved while maintaining adequate commonality with the C-5A? 3) Is the intended training adequate for crew members and maintenance personnel to perform the C-5 strategic airlift mission?

OT&E ACTIVITY

The test operation was based at the Lockheed-Georgia Facilities, Marietta Georgia. MAC furnished a pilot, flight engineer, loadmaster and six maintenance personnel for the test. The maintenance specialties were: airplane general, avionics, hydraulics, electric and pneumatics. The Air Force Airlift Center participation consisted of over-the-shoulder evaluations of both operations and maintenance related items. The limited hands-on operation available, precluded a comprehensive assessment. Fifteen flights (66.5 hours) using the first production C-5B were devoted to the test. No actual operational missions were flown, and no flights were devoted entirely to MAC'S test objectives.

OT&E ASSESSMENT

The MAC-conducted qualification operational test and evaluation could provide at best a cursory subjective view of the system. The C-5B test report dated June 1986 reflects the subjective rating of the MAC test cadre. A mixture of over-the-shoulder observations and actual hands-on operations was accomplished by qualified and current C-5A crew members on the airplane. They determined that flying and handling qualities are identical to the C-5A during all flight phases. Due to mechanical problems with the C-5B nose landing gear, the test vehicle was delivered with a C-5A nose landing gear. Difficulties were also experienced with other systems, including the autothrottle system; the instrument landing system; digital fuel quantity indicators; the Malfunction

Detection, Analysis and Recording system (MADAR II); fuel leaks; and door rigging. The Air Force is working to resolve these difficulties as well as other shortages/variances in the initial aircraft which have been delivered. Overall, within the limited test, the C-5B rating is "undetermined." However, the Air Force estimated that the C-5B will be satisfactory and will equal the capabilities of the C-5A airplane. A follow-on operational test will be conducted to evaluate operational effectiveness and suitability and identify operational deficiencies. Primary emphasis will be on completing objectives not completed during the QOT&E; evaluating changes and modifications made to correct deficiencies during prior testing; and evaluating reliability, maintainability and availability.

SUMMARY

Improvements incorporated in the C-5B were made to correct problems which surfaced in the C-5A since its introduction. Most of the changes were to improve corrosion protection and hydraulic subsystems; upgrade avionics, flight controls and the MADAR; and incorporate the latest engine configuration. Several shortfalls were evident in the initial production aircraft. Corrections to these are being undertaken and will be evaluated in future testing.

COMMON STRATEGIC ROTARY LAUNCHER (CSRL)



SYSTEM DESCRIPTION

The CSRL is a multi-purpose launcher to accommodate current and projected cruise missiles, short-range attack missiles and gravity weapons. It will be compatible to the maximum extent possible with the B-52H, B-1B, and the advanced technology bomber (ATB). The 265-inch-long launcher is installed in the aircraft bomb bay and provides eight weapon stations. The design allows uniform loads of any weapon as well as growth potential to unrestricted mixed loads. Initial integration on the B-52H will be limited to homogeneous loads of ALCM, B-83, B-61 or B-28 weapons. The B-52 Offensive Avionics System (OAS), Block II, will provide the software baseline for CSRL integration and includes provisions for all weapons planned for the CSRL. The launcher need not be removed from the aircraft to load or change weapons. Moreover, ability of the B-52/OAS to quickly retarget all weapons assures top-priority targets receive the available weapons in case of missile damage or malfunction.

BACKGROUND

Strategic Air Command's (SAC) requirements for internal carriage of various weapons drove the need to preclude a different type of internal carriage configuration for each type of weapon. SAC also has carriage requirements for future weapons such as the Advanced Cruise Missile, Short-Range Attack Missile II (SRAM II), and future conventional standoff weapons, as well as gravity bombs. Because a common launcher could best meet these requirements, the Air Staff determined it would be cost effective to require the CSRL to be compatible with all present Air Force strategic weapons, to standardize the launcher as much as practical for the B-52H, B-1B, and ATB, and to standardize future weapons to the launcher. The CSRL entered full-scale development in June 1983. An initial operational capability (IOC) is set for 1990.

OT&E ISSUES

Operational testing of the CSRL must address three critical issues: 1) Is a CSRL-modified B-52H capable of delivering all compatible weapons from the CSRL and from existing release systems without degraded accuracy? 2) Can Air Force maintenance crews load and checkout weapons on a CSRL-modified aircraft within timing requirements? 3) Can the aircraft diagnostics features and the electronic systems test set successfully and consistently isolate system malfunctions?

OT&E ACTIVITY

Initial operational test and evaluation (IOT&E) was conducted by the Air Force Operational Test and Evaluation Center (August 1985--August 1986) and a final report was published in October 1986. The test concurrently evaluated the CSRL and the B-52 OAS Block II software. The test team participated in 57 B-52H sorties during combined developmental and operational testing at Edwards AFB, California. Two of the combined DOT&E/IOT&E missions were flown from Carswell AFB, Texas, to evaluate the interoperability of a full load of 20 Air Launched Cruise missiles (ALCM). Since the B-52H test bed was not equipped with strategic radar, one sortie was flown with a B-52G at Griffiss AFB, New York, to verify strategic radar integration. The bulk of weapon delivery performance data was collected through simulated releases and launches. However the test effort did include actual high- and low-altitude gravity weapon releases, as well as actual SRAM and ALCM launches.

The CSRL hardware met all requirements for operational effectiveness and suitability. However, employment of an excellent CSRL system is affected by limitations in the mission planning and offensive avionics system. The CSRL meets all sortie generation requirements, and new procedures for replacement of Line Replacable Units (LRUs) improve generation timing. The OAS built-in-test performance and diagnostic capabilities were determined not to be satisfactory. Munitions loading operations on the CSRL were satisfactory. Mission reliability, logistic reliability, and maintainability also met requirements.

SUMMARY

The standoff capability and restrike flexibility of the B-52H will be significantly improved by the CSRL. The deliverable version of the OAS Block II software was not tested since revisions were still being made after completion of the test. A thorough evaluation of those revisions and a recheck of all critical OAS functions should be made by the using command prior to operational deployment of that software version.

DEFENSE SUPPORT PROGRAM MOBILE GROUND SYSTEM (DSP MGS)



SYSTEM DESCRIPTION

The Mobile Ground System (MGS) is designed to enhance Defense Support Program (DSP) ground station survivability. The system, which will process data down-linked from the DSP satellites and transmit reports to ground and airborne users, is comprised of multiple sets of two prime elements: the Mobile Ground Terminal (MGT) and Mobile Communication Terminal (MCT). The MCTs to be initially employed have been termed Limited Communication Vehicles (LCV) since they do not fully meet Air Force Space Command requirements. The MGTs and LCVs have been designed to look like standard commercial tractor-trailer rigs. They are capable of negotiating most primary and secondary roads; are transportable by C-5 aircraft, are capable of prolonged continuous operation; and can be rapidly reconfigured for road travel, moved to new locations and quickly set up again.

BACKGROUND

The MGS is already in full-scale production and is a follow-on program to the DSP simplified processing station (SPS) effort. The Air Force Operational Test and Evaluation Center (AFOTEC) conducted the IOT&E of the SPS in 1979 and SPS follow-on operational test and evaluation (FOT&E) I in 1980. The first MGT was delivered in September 1984 and the LCV was delivered in June 1985.

OT&E ISSUES

The IOT&E of the DSP MGS evaluated the operational effectiveness and suitability of the MGS. Some of the issues addressed were: 1) Can the MGS receive and process DSP data, and transmit data to system users? 2) Can the MGS provide enhanced DSP data processing and message transmission survivability? 3) Can the MGS convoys travel over primary and secondary roads and operate from deployed locations? 4) Does the MGS meet Space Command operational availability requirements? 5) Are the MGS mobile and fixed elements logistically supportable? 6) Does the MGS mobile design permit crews to effectively operate and maintain the system?

OT&E ACTIVITY

The test was conducted from 30 September 1985 to 31 March 1986 from a main operating base (MOB). A five-person AFOTEC test team, home-based at Detachment 4, Peterson AFB, Colorado, was on-station.

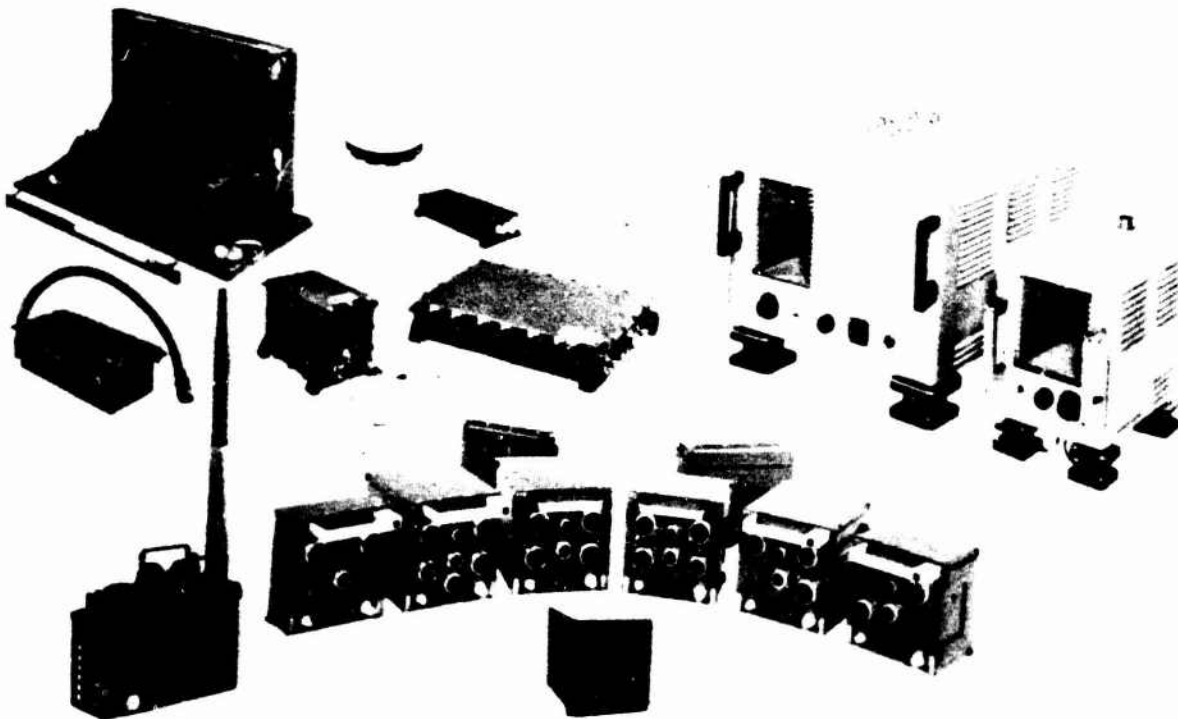
OT&E ASSESSMENT

Complete details of the test results are in the Mobile Ground System initial operational test and evaluation final report (AFOTEC project #0168), dated June 1986.

SUMMARY

The MGS convoys demonstrated a capability to operate with a high degree of mission success while deployed to distances of several hundred miles from the MOB. The MCTs employed during the test and now deployed operationally are termed LCVs, and do not fully meet mobility, hardening and suitability requirements. Some of their deficiencies (none of which precluded initial operational use) are being rectified through corrective action on service reports.

GLOBAL POSITIONING SYSTEM USER EQUIPMENT



SYSTEM DESCRIPTION

The Naval Global Positioning System (GPS) is a space-based, radio-positioning system to provide worldwide three-dimension position (16 meters spherical error probable), velocity (0.1 meters per second) and precise times (within 0.1 microsecond). The system has three major segments: the space segment, the control segment and the user equipment segment. The user equipment (UE) segment passively monitors signals from at least four GPS satellites, deriving satellite position and system time. The UE uses that information to derive precise time and its own position and velocity. Three types of UE have been developed for different operational environments: 1) the five-channel for high-dynamic environments; 2) the two-channel for medium-dynamic environments; and 3) the one-channel, or manpack, for low-dynamic environments. With the exception of the manpack, all user equipment will be installed and integrated in selected host vehicles. The manpack is designed for stand-alone operation.

BACKGROUND

On 22 December 1973, the Defense System Acquisition Review Council (DSARC I) approved Phase 1 (demonstration and validation) of the GPS user equipment. The Air Force was designated lead Service for a multi-Service development and test effort. Selected developmental tests were monitored during Phase 1, which was completed in 1979. DSARC II approved full-scale development for the user equipment in June 1979. Source selection for the UE was completed in April 1985, with Rockwell/Collins, Cedar Rapids, Iowa, being the successful bidder. The Air Force was the lead agency for the multi-Service operational test of GPS UE conducted by the Air Force Operational Test and Evaluation Center (AFOTEC), Navy Operational Test and Evaluation Force (OPTEVFOR), and the Army Operational Test and Evaluation Agency (OTEA).

OT&E ISSUES

Several common issues were addressed in the multi-Service tests. These were: 1) What are GPS performance parameters when operated and maintained by typical troops and crews? 2) Does GPS enhance the combat commander's ability to perform his mission? 3) What is the UE's availability, reliability and maintainability? 4) What are the significant survivability factors? 5) Is the selective availability feature effective? 6) Is GPS interoperable and compatible with its operating environment? 7) Is the training adequate for GPS UE operators and maintainers? 8) How does degradation of the space and control segments affect system accuracy? Service-unique issues were also addressed in testing conducted by the individual Services.

OT&E ACTIVITY

Each Service selected GPS host vehicles representative of the large number of weapon and support systems GPS has the potential to enhance. The AFOTEC tested the five-channel UE integrated into the F-16A and B-52G. The OTEA tested the one-channel UE in the manpack/vehicle configuration and the two-channel UE in the UH-60 helicopter. The OPTEVFOR tested the five-channel UE in the A-6E and an attack submarine (SSN), and the two-channel UE on an aircraft carrier (CV). Operational testing was conducted for a wide range of operational missions in realistic operational environments while the UE was operated and maintained by typical troops and crews. The major limitations were immature GPS user equipment and GPS/host vehicle integrations, limited number of developmental GPS satellites and a limited number of operational hours during IOT&E.

OT&E ASSESSMENT

Overall operational effectiveness was marginal, except for the GPS/UH-60 (2-channel UE), which was satisfactory. GPS UE demonstrated a significant potential to enhance the combat commander's capabilities in a broad spectrum of military missions. It met or exceeded all user requirements for position and navigation accuracy. GPS aided weapons delivery, except for F-16 loft bombing, also met or exceeded user requirements. However, satisfactory performance often required operator or maintenance work-around procedures or corrective actions to overcome initialization and GPS/host vehicle integration

problems. These were considered indications of GPS UE immaturity. Overall operational suitability was unsatisfactory. The significant number of hardware and software failures during the testing clearly caused reliability to be below the test criteria. Maintainability was also unsatisfactory because the built-in test/built-in test equipment (BIT/BITE) did not function properly or was not properly integrated. Numerous service reports were submitted to the program office by the test agencies.

SUMMARY

When the equipment worked, it provided excellent position accuracy. The systems as tested were not considered to be effective and suitable for combat without correction of deficiencies discovered during the tests. GPS is expected to eventually provide reliable, accurate navigation in peacetime as well as limited hostilities. However, there are risks associated with GPS degradation if it is relied on in a major conflict. Consequently, we believe the GPS system will be an adjunct to, rather than a replacement for, other navigation systems. Limited-rate initial production has been approved with correction of the known deficiencies. An additional phase of OT&E is planned to commence in 1988 to provide a basis for decisions concerning full-rate production.

GROUND LAUNCHED CRUISE MISSILE



SYSTEM DESCRIPTION

The Ground Launched Cruise Missile (GLCM) is a ground-launched variation of the TOMAHAWK Land Attack Nuclear Cruise Missile. The GLCM tactical system is made-up of are the all-up round, which includes the TOMAHAWK BGM-109G missile, booster and canister; the transporter-erector launcher, which carries four missiles; and the launch control center. The missile carries a nuclear war-head and flies a preplanned route using a self-contained inertial navigation system updated by digitized terrain-countour-matching map comparisons. The support subsystems are operations and basing, logistics and the Theater Mission Planning System.

BACKGROUND

The first full scale development flight of the GLCM missile occurred in May 1980 following a Defense System Acquisition Review Council (DSARC II) in January 1977. Initial operational test and evaluation (IOT&E) was combined with development test and evaluation (DT&E/IOT&E) from May 1982 through July 1983. Follow-on test and evaluation (I) (FOT&E(I)) was conducted from 1 June 1983 through 30 June 1984. Although the FOT&E(I) report stated that the weapon system can perform its mission, it directed management attention to the areas of power generation, system software, technical orders, trainers, and human factors. FOT&E II began 1 July 1984 to confirm correction of previously identified deficiencies, ensure that the system can meet operational requirements, support Department of Energy warhead testing and comply with Joint Chiefs of Staff weapon system evaluation guidelines. The deployment of GLCM is proceeding on schedule for full deployment of 464 missiles to six European operating bases by 1988.

OT&E ISSUES

The following critical issues apply to testing of the GLCM system: 1) Can reliable command, control and communications be established and maintained? 2) Can the missile, programmed by operational mission planners, maintain above-ground altitudes that provide adequate in-flight accuracy in the mission environment? 3) Can acceptable human, weapon system and nuclear safety be maintained? 4) Can the logistic support, operations and basing subsystems adequately support the GLCM weapon systems? 5) Is the system reliable and maintainable? 6) Are operator/machine interfaces adequate in the operational environment?

OT&E ACTIVITY

FOT&E II, conducted by the USAF Tactical Warfare Center under the direction of Headquarters Tactical Air Command, is examining the GLCM weapon system for the above operational effectiveness and suitability issues and was originally scheduled for completion in December 1985. Missile failures and equipment malfunctions during factory reconfiguration reduced the flight test data base below desired confidence levels, resulting in a planned extension of FOT&E II to December 1986. FY86 flight testing included the launch of eight missiles at the Utah Test and Training Range (UTTR) and Vandenberg AFB, California, using flight programs developed at Theater Mission Planning Centers in Europe. Testing also included evaluations at the European bases of communications capability as well as the transporter erector launcher (TEL) and Launch Control Center (LCC).

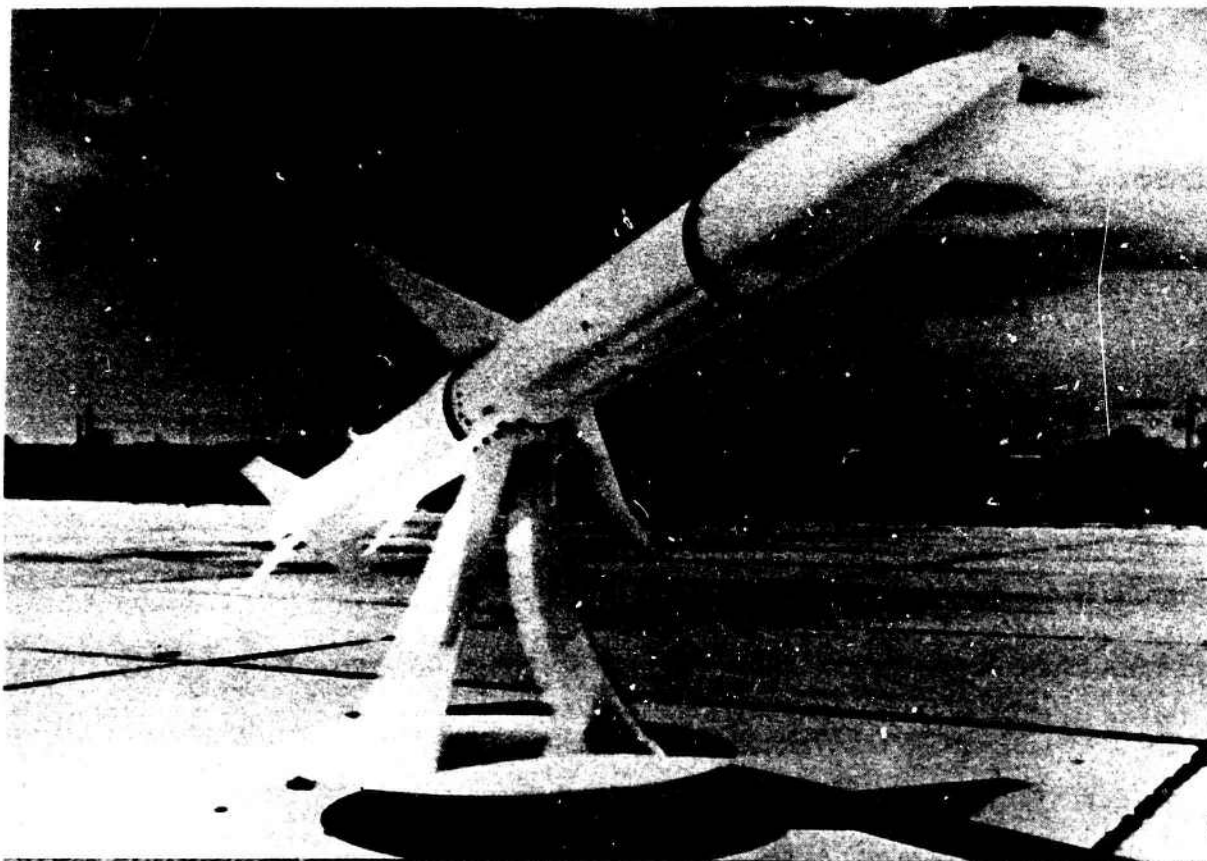
OT&E ASSESSMENT

Five of the eight missile flights resulted in premature flight termination. One was considered a "no-test" when termination was required after the safety chase aircraft lost sight of the missile. One was terminated early due to bad weather; however navigation error on that flight was excessive due to accelerometer failure. Of the remaining three unsuccessful flights, two resulted from failures during the rocket boost phase, and one was caused by failure of the guidance system.

SUMMARY

The GLCM weapon system has experienced a series of failures during the test program. Actions have been taken to improve quality control, both with subcontractors and during final assembly at the prime contractor's facilities. Missile deployment commenced prior to the system being completely proven, and management attention has been directed to the areas recommended in the August 1984 AFOTEC FOT&E(I) final report. Although the system has not yet attained the mission reliability expected for the mature system, its deployment is considered to be effective.

AGM-88A HARM (AF)



SYSTEM DESCRIPTION

The High Speed Anti-Radiation Missile (HARM) is an air-to-surface missile designed to suppress or destroy land- and sea-based radars which direct enemy air defense systems. HARM is a design evolution of ARM weapon (Strike and Standard ARM) and is the primary weapon used on the F-4G Wild Weasel defense suppression weapon system. Performance characteristics include: high speed, large footprint, high sensitivity to weak signals and software adaptability to the constantly changing threat. HARM weighs 807 pounds, is 164 inches long and 10 inches in diameter.

BACKGROUND

Joint USN/USAF initial operational testing of HARM began in 1979 and resulted in full production and USAF initial operational capability in September 1984. Missile deficiencies identified in testing are being addressed through a performance upgrade program.

OT&E ACTIVITY

During FY86, the Air Force continued follow-on test and evaluation (FOT&E) mission-enhancement fixes identified during previous testing and incorporated in the software for FY84 production missiles. The FOT&E will use four missile firings to evaluate the effectiveness and reliability of production missiles and ground support equipment and verify technical orders.

SUMMARY

No OT&E tests were completed in FY86.

AGM-65D MAVERICK MISSILE (IR MAV)(AF)



SYSTEM DESCRIPTION

The IR MAV (AGM-65D) was developed to complement the AGM-65A and B television-guided MAVERICK (TV MAV), by providing a capability at night or in reduced visibility against armor and other targets. The missile weighs approximately 485 pounds and employs a 125-pound conical shaped-charge warhead. Except for the forward section containing guidance and control, the physical structure of all MAVERICKs is similar. The seeker section contains the optical system that collects and focuses the incident infrared (IR) radiation and generates the (IR) image scan. The electronics section includes circuits for additional signal processing and scan conversion to standard television video format for cockpit display. The IR MAV reduces the effects of clutter, contrast and shadow, which hampered performance of the TV MAV.

BACKGROUND

Initial operational test and evaluation (IOT&E) of the AGM-65D was conducted from February 1981 to August 1982. During that series of tests, it was determined that operational suitability was deficient in the areas of incoming reliability, logistic reliability and mission-hardware reliability. After incorporation of contractor modifications, a Reliability Maintainability Validation Program was completed in February 1983. Although the number of assets available for this program was very limited, significant improvement was demonstrated in all areas of reliability and maintainability. Lot 2 production missiles (CY85 deliveries) included numerous changes incorporated as Engineering Change Proposal (ECP) 604. These changes were designed to enhance the producibility of the IR MAV guidance and control section. The IR MAV then entered low-rate initial production (LRIP) while OSD directed follow-on test and evaluation (FOT&E) further examined the following areas: 1) target array acquisition and attack by the IR MAV weapon system in unfamiliar terrain, day and night, during interdiction missions; 2) survivability of delivery aircraft when employing IR MAV; 3) impact of ECP 604 on IR MAV; and 4) operational suitability of the IR MAV. Test results demonstrated that tactical aircrews can acquire and attack valid targets in unfamiliar, European-like terrain. Survivability was satisfactory, and ECP 604 resulted in no statistical difference in effectiveness while significantly improving suitability. The operational suitability of the IR MAV exceeded all established thresholds with the exception of the Guided Missile Test Set (GMTS), which required further testing. Based on FOT&E results, the missile entered full production. An assessment of the FOT&E (Phase I) testing and results was reported to the Congress and the Secretary of Defense in the DOT&E Report of 16 April 1986.

OT&E ISSUES

In FY86 the operational suitability of the GMTS was evaluated in two special tests. In addition, IR MAV FOT&E (Phase II) was completed in November 1985. Phase II evaluated IR MAV suitability and operational effectiveness, refined tactics and techniques for employing the system, recommended training programs and evaluated corrections to deficiencies discovered in previous testing.

OT&E ASSESSMENT

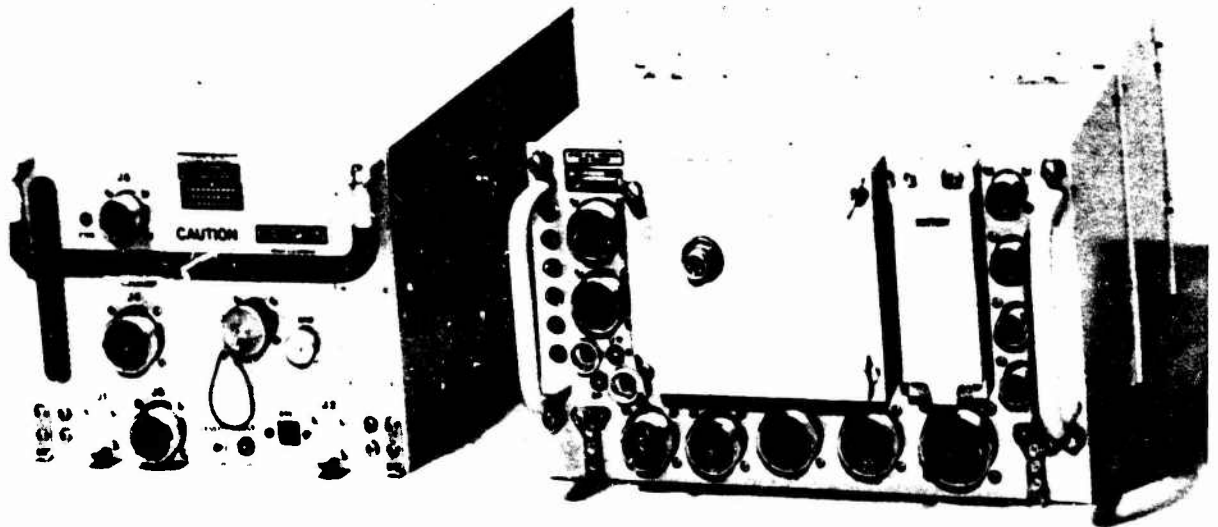
During FOT&E (Phase II), both day and night captive-carry sorties were flown in several environmental conditions against a variety of targets, including armored personnel carriers and tanks with operating engines. Nineteen day and night sorties were flown to accomplish 25 launches against vehicles with operating engines. Some of the data from the first part of FOT&E Phase II supported Phase I testing. The Phase I support consisted of 28 load-out cycles, 60 IR MAV training guided missile (TGM) passes with time-space-position information, 12 Maverick firings, and more than 125 hours of captive carry hours. Missile reliability was satisfactory, with incoming missile reliability demonstrated at 96% vice threshold of 95%, mission success probability of 96% vice 64%, and mean time between maintenance of 89.1 hours vice a threshold of 36 hours. Maintainability and logistics supportability were judged satisfactory, with no conclusion on the GMTS because of limited operating time. Employment tactics were developed with versatile employment capabilities of

the IR MAV presenting new tactical considerations, while the aircrew training requirement for IR MAV proficiency was adequate, with six sorties per training period. At the conclusion of special tests in July 1986 the GMTS demonstrated considerable improvement.

SUMMARY

Phase II of FOT&E demonstrated satisfactory operational effectiveness and maintainability. Logistics supportability was satisfactory, and the GMTS is now an accurate and useable piece of support equipment. Continued tactics development is necessary to fully utilize the missile's capabilities, and IR MAV aircrew training is required.

JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM (JTIDS)



SYSTEM DESCRIPTION

The Joint Tactical Information Distribution System (JTIDS) is a major acquisition program in the full-scale development phase. JTIDS is a jam-resistant and secure system to be integrated into multi-Service platforms to provide communications (data and voice), navigation and identification (CN^T) capabilities for joint and combined military force operations. A JTIDS system can distribute formatted and unformatted information where formatted data conforms to a specified message standard and unformatted data may come from different end user devices such as a voice digitizer or a teletypewriter. Communications is conducted in a time division multiple access (TDMA) procedure which is to permit thousands of users to participate on a single network to distribute information in a near real-time exchange. JTIDS information is broadcast omnidirectionally at many thousands of bits each second and can be received by any terminal within range. Each terminal can be set to select or reject each message according to its need for that information. A JTIDS equipped platform could use on-board navigation, weapons and radar systems to automatically feed status information to the integrated JTIDS terminal and then to a JTIDS net. This information could include target data, own platform position, altitude, ground speed, direction, fuel reserves, weapon reserves and radar signature returns.

BACKGROUND

The Air Force is lead Service for the JTIDS program, which combined Navy and Air Force efforts from their separate programs in 1973. Each Service continued to pursue different architectures until October 1985, when the Navy terminated all plans to procure their developed terminals and join with the Air Force to use TDMA modules for integration into selected platforms, excluding the F/A-18. The Army has initiated development of a reduced size and capability terminal for ground system integration, while continuing development tests of the current terminal being developed by Air Force. The Army will not use JTIDS in aircraft applications. Plans are being made to develop a lower volume terminal for NATO applications and smaller aircraft such as F-16 and F/A-18.

OT&E ISSUES

Issues concentrate on the extent to which OT&E can determine operational effectiveness and suitability of JTIDS in a multi-Service test scenario including projected force ratios and validated threat realism. Other issues include the extent of improvement in combat effectiveness and interoperability in joint and combined operations. These issues are reflected in the OT&E activities to establish criteria for approval in the test and evaluation master plan (TEMP) and initial operational test and evaluation (IOT&E) plan.

OT&E ACTIVITY

OT&E activity included reviews of the IOT&E concept, the IOT&E plan and the TEMP for approval prior to initiation of the systems phases of test. Testing has been conducted in the McDonnell Aircraft F-15 combat simulator at St. Louis, Missouri. The simulator was used to train test pilots for the systems phases of test and to collect data for comparison of F-15 mission performance with and without JTIDS combined with different weapons under selected threat scenarios. Defensive counter-air missions were planned with two F-15s versus up to eight hostile aircraft. No data is available from this simulation at this time.

OT&E ASSESSMENT

Efforts are continuing to certify the JTIDS ready for systems phases of IOT&E. Improvements are being made in the TEMP and IOT&E plan to determine the answer to critical issues. Limitations in the systems test resources and platform-integrated JTIDS terminal performance are projected to delay completion of an adequate OT&E to support planned FY87 procurement decisions.

SUMMARY

The planned start of the systems phases of IOT&E have slipped by about nine months due to limitations in JTIDS terminal and integrated system performance. Completion of development tests and certification of readiness for IOT&E will proceed the multi-Service tests to support FY87 procurement decisions. DOT&E will provide an independent assessment of IOT&E results to support these decisions.

LOW ALTITUDE NAVIGATION AND TARGETING INFRARED FOR NIGHT SYSTEM (LANTIRN)



SYSTEM DESCRIPTION

The LANTIRN system is being developed to fulfill the need for a night attack capability in the close air support, battlefield interdiction, offensive counter-air, and air-interdiction mission areas. The system is designed for use on F-16C/D and the F-15E aircraft and consists of the wide field-of-view (WFOV) head-up display (HUD), the navigation (NAV) pod and the targeting pod. The head-up display is an electro-optical device which computes flight, navigation and weapons delivery information and displays it in the pilot's line-of-sight. The NAV pod contains a forward-looking infrared receiver (FLIR), a terrain-avoidance radar and subsystems for servo-control. The targeting pod functions include FLIR imaging, laser designation, precision pointing and tracking, missile boresight correlation for AGM-65D MAVERICK handoff and missile lock-on.

BACKGROUND

Combined development test and evaluation (DT&E)/initial operational test and evaluation (IOT&E) of the LANTIRN system began in July 1983. The LANTIRN program was restructured in August 1984 as a result of lagging target pod development, budget constraints, and unavailability F-16 test-bed aircraft.

After program restructuring, IOT&E of LANTIRN began in October 1984 and was completed in two phases, which ended in April 1986. Test results were intended to support a full-production decision for the NAV pod, while future OT&E will evaluate remaining targeting pod deficiencies before a full-production decision is made for that LANTIRN component. The Director, Operational Test and Evaluation report to the Congress and the Secretary of Defense dated 14 November 1986 addressed the adequacy and results of the IOT&E of the NAV pod. The section below discusses the results of the IOT&E of the complete LANTIRN system.

OT&E ISSUES

The IOT&E critical issues for LANTIRN were addressed in two major areas: operational effectiveness and operational suitability within defined operational and maintenance concepts. Operational effectiveness issues are: single-seat effectiveness, effective aid to navigation, transition to attack, attack capability, and survivability. Operational suitability issues are: reliability, maintainability and supportability within the framework of the Air Force support system. Six operational effectiveness and six suitability objectives were used to evaluate these critical issues.

OT&E ASSESSMENT

The operational effectiveness evaluation of the LANTIRN system addressed six objectives. Of these, four were rated satisfactory: terrain avoidance performance, effect on aircraft survivability, electro-optical countermeasures vulnerability and effect of integration into the tactical air forces. Adequacy of LANTIRN and F-16 controls and displays and their compatibility were rated unsatisfactory. The areas evaluated under critical effectiveness issues showed that pilots of single seat, LANTIRN-equipped aircraft were able to operate safely and effectively at low altitude during day or night under-the-weather conditions. Pilots successfully used the WFOV HUD and NAV pod to fly as low as 200 feet over all types of terrain and 100 feet over level terrain and water using manual terrain following. Terrain-avoidance performance was satisfactory. Navigation performance was satisfactory, but was limited (in peacetime) by the lack of an eye-safe laser to provide accurate navigation system updates outside of range airspace. An eye-safe laser is currently being developed to satisfy this new requirement.

The LANTIRN system improved survivability at night over the F-16 without LANTIRN. The NAV pod and WFOV HUD provided a night ingress and egress capability that permitted operations at lower and more survivable altitudes than currently possible. System performance was satisfactory in the presence of battlefield effects and electro-optical countermeasures.

LANTIRN's capability to integrate into the Tactical Air Force (TAF) was rated satisfactory. However, pilot workload, training and mission support will be affected. Pilot workload was low for the navigation and terrain following

tasks, and varied from low to moderate for conventional or MAVERICK deliveries to very high for long-range laser guided bomb (LGB) deliveries. Pilots using the LANTIRN system will require high levels of training to maintain proficiency, especially with the addition of the targeting pod. Increased support will be required in some areas such as weather and intelligence.

LANTIRN/F-16 controls and displays were unsatisfactory. The targeting pod wide field-of-view was out of focus and several targeting pod and aircraft displays and associated switch actions were poorly mechanized. However, the WFOV HUD was satisfactory for the F-16 mission, and the video display was excellent for the low-level navigation and terrain-following tasks at night.

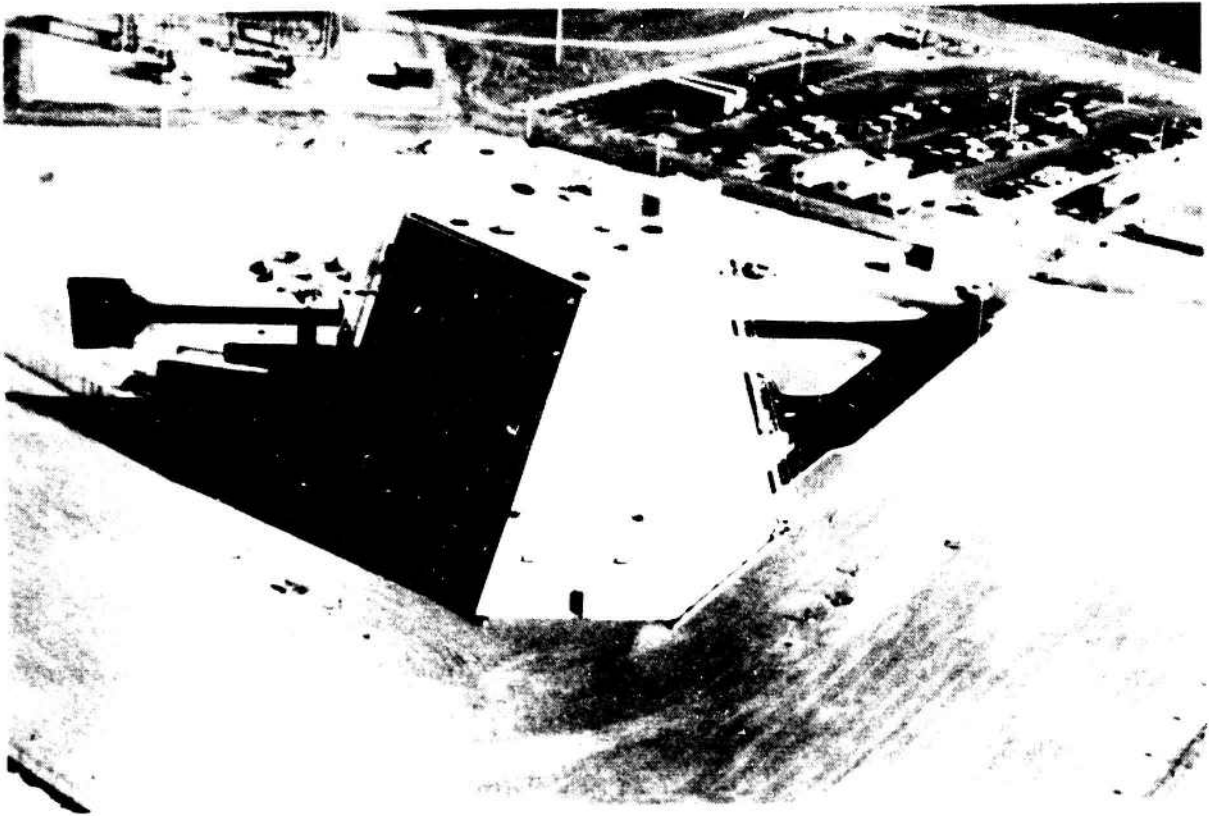
As tested, LANTIRN compatibility with current delivery modes and weapons was unsatisfactory in some areas. The targeting pod FLIR performance did not allow target identification at sufficient slant range for long-range toss deliveries and targeting pod tracker stability/tenacity was inadequate. Unguided weapon deliveries were not flown because of unresolved aircraft bomb ballistics. MAVERICK delivery capability was satisfactory overall, although handoffs from the targeting pod to the missile were not as fast as desired under certain conditions.

The operational suitability evaluation was addressed by six objectives. Logistics reliability, systems availability and software supportability were satisfactory. Mission reliability was marginal primarily because of targeting pod nose/roll section and environmental control unit failures. System maintainability was rated marginal for targeting pod problems with the nose/roll section, coolanol leaks, water intrusion, and built-in test. The logistics supportability evaluation were incomplete because integrated logistics support elements were not available during the test.

SUMMARY

The LANTIRN system provides a night, single-seat, low-altitude operational capability that does not currently exist in the TAF. The targeting pod provided an improvement in low-level navigation, an enhanced MAVERICK capability and a short-range LGB capability against prominent infrared targets. Target tracker deficiencies, inadequate targeting pod FLIR performance at longer ranges and high single-seat workload because of control and display problems prevented delivery of long-range LGBs, except against a limited target set under ideal conditions. LANTIRN integration into the TAF will require demanding, unique training requirements and enhanced infrared mission planning capability. The operational suitability of the NAV pod and WFOV HUD improved significantly over the period of testing and is projected to meet user requirements. However, identified targeting pod design deficiencies and nose/roll section reliability adversely affected the suitability of the overall system. The targeting pod requires further improvement and testing before it will fully meet the needs of the user.

PAVE PAWS



SYSTEM DESCRIPTION

PAVE PAWS is a large phased array radar system used for early warning of Submarine Launched Ballistic Missiles. It has a secondary mission of supporting of the US Air Force SPACETRACK system. The PAVE PAWS system interfaces with the Cheyenne Mountain Complex (CMC), the National Military Command Center (NMCC), the Strategic Air Command (SAC) and the Alternate National Military Command Center (ANMCC).

BACKGROUND

Two radar systems are installed and operational at Otis AFB, Massachusetts, and Beale AFB, California. Currently, two additional sites are under development in Georgia (Robins) and Texas (Eldorado). The next phase of the program upgrades the four-system network.

OT&E ISSUES

The critical issues are whether the system in development: 1) provides credible missile warning data in a timely manner; 2) provides the required satellite surveillance and tracking data, and 3) provide the required digital transmission and reception of messages to and from CMC and NAVSPASUR, to SAC, NMCC and ANMCC.

OT&E Activity

OT&E began on the Robins AFB system in late September 1986.

PEACEKEEPER MISSILE



SYSTEM DESCRIPTION

The Peacekeeper missile is a four-stage ICBM designed to deliver up to 10 Mk-21 reentry vehicles (RVs) to individual targets. The missile is approximately 71 feet long and 92 inches in diameter, weighing about 195,000 pounds. The first three stages use solid propellants, achieving thrust-vector deflection with single-stage movable nozzles. The second and third stage nozzles use specially designed extendible exit cones (ENEC). These three boost stages produce most of the velocity needed for intercontinental range. The fourth stage provides any needed velocity and attitude corrections prior to release of the Mk-21 RVs. The missile will be deployed in modified Minuteman launch facilities containing operational support equipment to provide communication and launch functions.

BACKGROUND

Full-scale development of this intercontinental missile was initiated in 1979. In October 1981 the President redirected the program to a silo basing concept for the initial Peacekeeper deployment. A four-phase, 20-launch test program is planned. The combined development (DT&E) and operational (OT&E) testing commenced in September 1982 with ground activities at Vandenberg AFB, California, using an inert missile to verify compatibility of facility procedures prior to assembly and launch of the first flight missile. The test program will evolve from mainly DT&E toward OT&E-oriented objectives. Program phases are 1) missile functional performance, 2) missile/RV capabilities and silo integration, 3) weapon system performance, and 4) operational system verification.

OT&E ISSUES

The combined DT&E/OT&E is investigating the following issues: 1) mission effectiveness, which addresses targeting efficiency, alert availability and launch and flight reliability; 2) probability of damage, which addresses weapon system accuracy, weapon yield and target hardness; 3) survivability, which addresses capabilities of the hardware to perform critical functions following subjection to nuclear weapon effects; 4) weapon system integration, which addresses and verifies interoperability of new and existing systems, support equipment and facilities; and 5) weapon system operation and support, which encompasses logistics reliability, maintainability, support equipment, transportation and handling, technical data, supply support, manpower and training.

Two primary, system-level measures of effectiveness will quantitatively measure the degree to which the weapon system performs its operational tasks. The first, the Mission Effectiveness Factor (MEF), projects on a total force level the percentage of deployed warheads that would produce a nuclear detonation in their planned target areas during wartime execution. The second, Probability of Damage (PD), expresses the probability that the resulting nuclear detonation would inflict damage on the intended targets. These are expressed as follows:

$$\text{MEF} = \text{Targeting Efficiency} \times \text{Alert Availability} \times \text{Weapon System Reliability}$$
$$\text{PD} = f(\text{Weapon System Accuracy, Warhead Yield, Target Hardness})$$

The elements of the above equations (weapon system reliability and accuracy) are directly testable and, therefore, become the essential evaluation products of the combined DT&E/OT&E test program. Targeting efficiency and availability contain some directly testable elements but require the use of simulation and modeling techniques to derive the final product. Warhead yield and target hardness, the last elements of the equations, are provided, respectively, by the Department of Energy and SAC. The remaining three OT&E issues (survivability, weapon system integration and system operation and support) will be addressed by qualitative assessments.

OT&E ACTIVITY

Fourteen of the planned 20 test flights from the Western Test Range at Vandenberg AFB have been completed through FY86. The last five of these were completed during FY86, with increasing emphasis on development and test of hardware and software necessary for system integration. Flight number 10 (13 November 1985) demonstrated booster and Mk-21 RV performance in a stressed environment. The eleventh flight (7 March 1986) demonstrated a capability to deploy eight Mk-21 RVs on nominal trajectories. The twelfth flight (21 May 1986) increased the number of RVs to 10 with successful deployment. Flight 13 (23 August 1986) demonstrated the capability to assemble the missile in a launch facility and was the first launch from an operationally configured launch facility. That flight also included the deployment of Mk-21 RVs to two target areas, including a land impact.

Phase three of the test program commenced with the 18 September 1986 launch of the fourteenth flight. That was the first flight to carry prototype penetration aids (decoys) along with the RVs. Although the RVs deployed properly, the decoys did not release. That anomaly is being studied as part of the penetration aids technology development program. Phase three of the test program will continue with flights 15 and 16 emphasizing the operational subsystem configurations and flight profiles. The final phase, which is scheduled for completion in 1987, will consist of the last four launches to verify any configuration changes as well as operational procedures.

TACTICAL AIR OPERATIONS CENTRAL/MODULAR CONTROL EQUIPMENT



SYSTEM DESCRIPTION

The Tactical Air Operations Central/Modular Control Equipment (TAOC/MCE) is not a major acquisition program, but was designated for oversight in accordance with 10 U.S.C. 138. The program is completing the full-scale development phase and preparing to transition to the low-rate initial production (LRIP) phase. The basic unit being developed is the Tactical Air Operations Module (TAOM), which is nomenclatured AN/TYQ-23(V) and used in varying combinations as basic system modules to replace the currently deployed Marine Corps Tactical Air Operations Central (TAOC)/Tactical Data Communications Central (TDCC), collectively known as the Marine Tactical Data System (MTDS), and the Air Force Control and Reporting Center (CRC)/Control and Reporting Post (CRP) and Forward Air Control Post (FACP) systems, known as 407L and 485L. TAOC/MCE automated air command and control systems are formed by use of TAOMs, which are contained in eight-by-twenty foot transportable military shelters. Tailoring of the tactical air control system capacity is achieved by the use of one or more of the TAOMs. Up to five TAOMs are to be interconnected with fiber optic cables at lengths to allow dispersion for tactical or other considerations. All mission-essential equipments are internal to the module except the separate radars, identification friend or foe equipment, and prime power sources. Provisions are included for accepting inputs from two power sources with an automatic switchover capability. Shelter design is to allow the transport of a TOAM by fixed or rotary wing aircraft, ship, rail or truck. On- and off-loading is to be accomplished by crane, container transporter or fork lift.

BACKGROUND

The multi-Service program is to develop a new tactical air operations command and control capability to replace existing Marine Corps and Air Force systems. Acquisition is conducted by the Marine Corps under a Navy contract. The Marine Corps initiated development in 1978, and the Air Force entered the program in 1982 to result in the current full scale development system being tested by the respective Services. Four modules have been delivered for test by Marine Air Control Squadron-One (MACS-1) at Camp Pendleton, California, and one module was delivered to Hurlburt Field at Eglin Air Force Base, Florida. The Services plan various future improvements to the system to add jointly developed standard JTIDS jam-resistant communications and other separately developed capabilities.

OT&E ISSUES

Different issues are applied by the Marine Corps and the Air Force. The Marine Corps issues include the capability to increase mobility and modular capability, reduce mission reaction time, increase system capacity, improve commonality among modules, enhance graceful degradation and possess the capacity to fully exploit the capabilities of new sensors, communications systems and weapons during the system's lifetime. Air Force issues include the capability to function as elements of the ground tactical air control system (TACS), sustain operations in TACS despite reconfiguration or losses due to hostile action, be deployed and redeployed in the tactical environment, interoperate with other command and control facilities and systems, and to support sustained operations within the maintenance concept. The plans for a low-rate initial production (LRIP) decision in September 1986 have changed to a decision in FY87. These issues are being considered in preparation of the test reports and a multi-Service test and evaluation master plan (TEMP) to support planned FY87 procurement decisions.

OT&E ACTIVITY

The Services conducted initial operational test and evaluation (IOT&E) on the TAOMs during FY86. The Air Force tested one module at Hurlburt Field starting in June 1986, and MACS-1 tested four modules at Camp Pendleton starting in July 1986. Modules were transported from Camp Pendleton to Hurlburt Field in September 1986 for additional tests, including interoperability of the different modules and the ability to reconfigure computers, software and operator consoles. The Marine Corps Operational Test and Evaluation Activity (MCOTEA) and Air Force Operational Test and Evaluation Center (AFOTEC) will review IOT&E results and prepare independent evaluation reports. DOT&E staff assistants observed conduct of the IOT&E at Camp Pendleton and Hurlburt Field. Service efforts continued to prepare the IOT&E reports and a TEMP for approval to support FY87 procurement decisions.

OT&E ASSESSMENT

MCOTEA has completed an independent evaluation report of IOT&E conducted at Camp Pendleton by MACS-1. AFOTEC has completed a quick-look interim report and is preparing an independent evaluation report of IOT&E conducted at Hurlburt Field. These reports will be forwarded to DOT&E for review and assessment to support FY87 procurement decisions. A DOT&E beyond-LRIP report

to Congress and the Secretary of Defense will be submitted before any final decisions to proceed with full-rate production. The TEMP will also be approved by DOT&E to support these decisions and outline follow-on operational test and evaluation (FOT&E) requirements.

SUMMARY

IOT&E is essentially complete and detailed final reports being developed by MCOTEA and AFOTEC. Some Air Force IOT&E is continuing into 1987. Procurement decisions are scheduled in FY87, with FOT&E to be approved in the multi-Service TEMP and OT plans.



SYSTEM DESCRIPTION

The T-46 is a training aircraft with side-by-side seating, twin engines, and pressurization. The design incorporates off-the-shelf equipment where possible while the turbofan engines and airframe technology are state-of-the-art to ensure fuel efficiency. The T-46 was designed to replace the T-37 in all USAF training roles and correct existing T-37 deficiencies, including high fuel consumption, weather limitations, limited range and endurance, outdated avionics and instruments, noise levels that exceed limits, high maintenance costs and low performance.

BACKGROUND

First flight of the T-46 was successfully completed on 15 October 1985. Congress appropriated funds for FY86 Lot II production aircraft and long-lead funds for Lot III. The Air Force cancelled the program in FY87, and OSD withheld FY86 production funding. In October 1986, Congress directed that FY86 production funds be used to conduct a competitive fly-off for a replacement trainer aircraft.

OT&E ISSUES

The critical operational test issues as stated in the T-46A test and evaluation master plan (TEMP) dated January 1985 are: capability to meet operational performance requirements and be an effective primary trainer. The suitability issues are: capability to effectively maintain and support the T-46A throughout its life cycle and its availability at maturity.

OT&E ACTIVITY

The first prototype T-46 number 1 aircraft flight took place at Edwards AFB, California, on 15 October 1985. This aircraft flew 129 developmental/operational sorties and accumulated 197.2 hours during FY86. Combined DT&E/IOT&E activities on the aircraft have concentrated on clearing the flight envelope, evaluating basic flying qualities, evaluating the cockpit environment, and judging the performance and handling characteristics for the types of maneuvers accomplished in pilot training. Prototype T-46A number 2 arrived at Edwards on 15 August 1986 and had flown 28 developmental/operational sorties and 40.6 hours as of 30 September 1986. Combined DT&E/IOT&E activities on the second aircraft have been very similar to those described for T-46 number 1. At the end of FY86, OT&E pilots had flown on 59 of the 157 total test missions since the first flight in October 1985. From the beginning of the test program, the IOT&E test team has taken an active role in the development of mission scenarios to incorporate as many operational objectives as possible. This early involvement has allowed the team to complete nearly 30% of its effectiveness combined test event matrix. The majority of this T-46 flight evaluation has been in the low/mid-airspeed/altitude envelopes and includes maneuvers in the aerobatics, instrument and formation flight categories. The collection of T-46 operational suitability data is steadily progressing. Air Force personnel are working side-by-side with the contractor to maintain the two prototype aircraft at Edwards AFB. This hands-on involvement has enhanced activities related to with assessing support equipment, technical orders, accessibility to aircraft components and ease of repair. Appropriate Service reports have been written documenting suggested changes. IOT&E is scheduled for completion in December 1986.

PART VI
JOINT OT&E

JOINT OPERATIONAL TESTS OF U.S. RETALIATORY CAPABILITIES IN CHEMICAL WARFARE (JCHEM)

PROGRAM DESCRIPTION

JCHEM is an intensive joint operational test and evaluation (JOT&E) program that was initiated to promote improvements in U.S. chemical warfare (CW) retaliatory capabilities. The program supports the overall policy of CW deterrence by assisting in improving joint Command, Control and Intelligence (C2I) procedures, planning and targeting procedures, logistical plans and procedures, utilization of the current stockpile, training and readiness of forces and the transition to binary chemical munitions.

BACKGROUND

A 1980 study by the Defense Science Board called for a reevaluation of the ability of the U.S. to deter chemical warfare. In 1982, the Pacific Command (USPACOM), in response to a Director, Defense Test and Evaluation (DDT&E) request for joint test nominations, proposed a joint test of U.S. CW retaliatory capabilities to the Organization of the Joint Chiefs of Staff (OJCS). The DDT&E accepted the USPACOM nomination, and a provisional joint test force (JTF) was formed in April 1983 with a limited charter to develop and provide a coordinated concept and approach for a joint chemical warfare test program. In March 1984, after unanimous agreement to the concept and approach by all the Services, the OJCS and four unified commands, the JCHEM JTF was issued a full charter to conduct a test program on retaliatory CW capabilities.

The original JCHEM concept was a two-phase program spanning three calendar years:

- | | | |
|-----------------------|----------|---|
| o CY 1985 | Phase IA | Initial baseline assessment of current CW retaliatory capabilities. |
| CY 1986 | Phase IB | Final baseline assessment of the current CW retaliatory capability and its impact on theater campaigns. |
| o CY 1987
(OPTION) | Phase II | Evaluation and validation of modified unitary munition procedures. Projected CW retaliatory capabilities resulting from the introduction of binary weapons. |

Phase I was limited to the current unitary weapons stockpile. During Phase II it was planned to test and validate modified unitary munitions procedures and examine the possible improvements in capability that would result from retaliatory procedural changes made possible by the introduction of binary weapons. A decision was made in 1986, by the Director of Operational Test and Evaluation, to discontinue the JCHEM test program upon completion of Phase I.

The team and its expertise has been offered to the Joint Chiefs of Staff (JCS) to assist them and selected unified commands in continuation of the resolution of systemic problems documented as a result of the test program.

The Phase I Baseline Report assesses U.S. retaliatory capabilities in selected operational theaters as of the end of CY86. It defines the CW retaliatory process, establishes current capabilities, identifies problem areas and recommends improvements for consideration by OSD, the OJCS, and the commanders-in-chief of appropriate unified commands and the Services. Finally, the report assesses the impact of the current CW retaliatory capabilities on the overall campaign outcome in each of the three theaters assessed. The Baseline Report is scheduled to be published on 1 May 1987.

PROGRAM ISSUES

The overall objectives of Phase I of the JCHEMA test program were to determine the current capability of the U.S. to jointly prepare for, conduct and sustain retaliatory chemical warfare; to identify systemic problems in carrying out retaliatory CW; and to recommend corrective actions for the identified problems. To assess current retaliatory capabilities, five aspects of chemical warfare were examined. These aspects are 1) theater conditions, 2) response time for retaliation, 3) employment of chemical munitions, 4) survivability in a chemical environment, and 5) the impact of retaliatory CW on theater combat operations.

PROGRAM ACTIVITY

In coordination with the OJCS and selected CINCs, members of the JTP identified operational exercises which were suitable for testing of retaliatory procedures. They gathered data in a total of 18 exercises. Test data from exercises alone would not satisfy all objectives. Thus, the additional data required by JCHEMA was obtained from auxiliary tests, studies conducted by the Institute for Defense Analyses (IDA), interviews with appropriate organizations and, finally, Service activities. Data from all sources is being consolidated and analyzed for purposes of defining the baseline U.S. CW retaliatory capability, deriving systemic problems and devising recommendations for possible improvements.

SUMMARY

Significant positive changes in U.S. CW retaliatory capabilities have occurred at the OJCS, Service and specified/unified command levels since JCHEMA was activated. The JCHEMA Baseline Report, scheduled to be published and distributed by 1 May 1987, will document findings, on-going actions and recommendations for further improvements.

APPENDIX

"Operational Test and Evaluation Techniques
in the Department of Defense:
Recommendations for Improvement"
(Executive Summary)
Report to the Secretary of Defense
By the Director
Operational Test and Evaluation
24 September 1986

In accordance with a Secretary of Defense Memorandum of 1 April 1986, this report examines the techniques, role, and organization of operational test and evaluation (OT&E) in the Department of Defense (DoD) acquisition process, assesses the adequacy of OT&E as currently organized, conducted, and reported, and makes recommendations for improvement in light of the proposals of the President's Blue Ribbon Commission on Defense Management (Packard Commission).

The underlying themes of this report and the goals to which its recommendations are keyed are:

--Test and evaluation in support of procurement decision making must be focused to answer operational--"Will it work?"--questions;

--Responsibility and accountability for "enough testing," "enough realism," and independent, timely reporting of results must be clearly established both within the Services and OSD; and

--Realism, efficiency and productivity of testing must be improved, while at the same time reducing the cost of testing.

RECOMMENDATIONS

o Maintain and Enhance OT&E Independence

(A) The Director, Operational Test and evaluation (DOT&E) should remain organizationally independent of all acquisition and research and development officials and entities. He should continue as an Assistant Secretary of Defense-level official within the Office of the Secretary of Defense (OSD) responsible for OT&E policy and oversight, DoD-wide, and he should continue to serve as a permanent member of the Joint Requirements and Management Board and the Defense Resources Board (DRB). The DOT&E should continue to report without intervening review and approval to the Secretary of Defense (SecDef) and the Congress, and he should be required to maintain a close advisory and working relationship with the Under Secretary of Defense for Acquisition (USD(A)). The DOT&E should keep the USD(A) fully and currently informed on all OT&E matters and provide him with (1) unvarnished, independent assessments of the results of all T&E carried out in support of procurement decisions as soon as they are completed, (2) exactly the same information he is required by law to provide to the SecDef and the Congress, and (3) any additional information the USD(A) may need to carry out his acquisition-decision responsibilities.

(B) Each Service should establish a Service Test and Evaluation Executive (ST&EE) selected by the Service Secretary. This executive should be a civilian with a rank at least equal to that of a Service Deputy Assistant Secretary. The ST&EE should be responsible for the full-time oversight of his Service's T&E programs, and his Service's Operational Test Agency (OTA) should report directly but not necessarily exclusively to him. The ST&EE should advise and work closely with his Service's Acquisition Executive (SAE) and Program Executive Officers (PEOs). The ST&EE should keep his Service Secretary, Service Chief, the SAE, PEOs, and the DOT&E fully and currently informed on T&E matters bearing on his Service's major acquisition programs. The ST&EE should facilitate communication between his Service's OTA(s) and the DOT&E and assure that all T&E information and reports provided to the DOT&E are transmitted exactly as prepared by the Service OTA(s) and other officials responsible for T&E planning and execution. The DOT&E and the ST&EEs should present T&E views and findings directly to the most senior decision makers in OSD and the Service secretariates.

- o Consolidate OSD-level OT&E Management and Oversight

Consolidation of T&E roles should focus on reduction of testing costs, while creating responsibility and accountability for "enough testing," "enough realism," and independent, timely reporting of results.

Responsibility for all OT&E and OT&E-related oversight and management roles currently assigned to the Deputy Under Secretary of Defense for Research and Engineering (Test and Evaluation)(DUSDR&E(T&E))--including the entire Joint Operational Test and Evaluation (JOT&E) Program, the Foreign Weapons Evaluation Program, the NATO Cooperative Testing Program, the Foreign Materiel Exploitation Program, and management of the OT&E-related elements of the Major Range and Test Facility Base (MRTFB)--should be reassigned to the DOT&E as required by law. The DOT&E should be allocated additional personnel slots to permit him to carry out his duties.

- o Underwrite Needed Test and Evaluation Capabilities

Improved productivity in DoD testing, with a concurrent reduction in the cost of testing, must be pursued.

(A) T&E capabilities investment of all types should be funded from a new OSD budget line--a "DoD T&E Capabilities Program" line--that is underwritten through a uniform-percentage contribution from the Advanced Development, Engineering Development, Operational Systems Development, and associated systems procurement lines. The T&E Capabilities Program line should be managed by the DOT&E. Planning and programming should be done with full Service participation through the ST&EEs and SAEs, but the DOT&E should be the decision authority for program priorities, providing funds from the T&E Capabilities Program line on a competitive basis and according to a long-term investment roadmap developed by the DOT&E in consultation with the USD(A) and with the assistance of the ST&EEs and the SAEs. The Services should continue to manage and fund the operation of T&E facilities, involving the private sector to the fullest possible extent to achieve innovation, efficiency, enhanced productivity, and cost reductions.

(B) Adequate, realistic OT&E test capabilities should be developed and put in place as soon as possible. These capabilities should be funded through the T&E Capabilities Program and be operated as national test assets (part of the MRTFB) to achieve the greatest possible benefit for all T&E and training activities.

- o Require and Facilitate Early and Continuous OT&E

Allowing a program to mature to the full-rate production decision point prior to the first operational evaluation or assessment creates an inordinately high risk of fielding an ineffective system and incurring an irreversible investment loss.

The DOT&E, working closely with the USD(A) and the ST&EEs, should develop policies and procedures designed to require and facilitate OT&E involvement from the inception and throughout the lives of all major acquisition programs. These policies should include requirements for (1) development and reporting of operational utility assessments of competing concepts during the concept exploration and demonstration-validation phases, (2) assessing and reporting on the military utility of prototype technologies and civilian products, and (3) evaluating and reporting on the validity of program baselines and cost-schedule/performance tradeoffs in light of operational requirements. They should also encourage the use of simulation and modeling during all phases of the acquisition process to augment and supplement--not replace--the realistic field testing that always must be accomplished. In developing these policies and procedures, the DOT&E should take care to ensure that OT&E is carried out in a manner that precludes interruption, delay, or prejudgment of the engineering development process.

- o Refocus the Joint Operational Test (JOT&E) Program

Current developmental joint tests--chartered initially as operational tests--are now of questionable value.

The DOT&E should be required to justify to the SecDef and the Congress the need for each JOT&E before the test begins. Each JOT&E should be strictly limited as to objectives (questions to be answered), cost (test designed to fixed costs), and duration (nominally, two years), and should not be undertaken unless there is an OSD or Joint Chiefs of Staff (JCS) sponsor tasked with the responsibility of assuring that needed changes identified by the JOT&E will be implemented. The staff of the lead Service's OTA should be temporarily augmented to carry out each JOT&E (vice the current method of creating an ad hoc organization for each test). This organizational arrangement should be clearly temporary and designed to inhibit the natural tendency of all bureaucratic endeavors to take on lives of their own. As the acquisition-related responsibilities of the JCS are expanded, there will be increased JCS involvement in the selection, monitoring, and follow-up of JOT&Es. Specific arrangements for ensuring smooth coordination of JOT&E matters among DOT&E, JCS, and the Services should be developed. The DOT&E should include in his Annual Report an accounting of the progress, status, effectiveness, and cost of each JOT&E that was active during the fiscal year covered by the report.

o o o o

The Packard Commission's recommendations have the potential of inspiring dramatic, genuine reform of the defense acquisition process. The measure of our success will be whether we are indeed able to field better weapon systems and equipment more quickly and at lower cost than in the past. An independent, robust DoD operational test and evaluation organization and process alone cannot assure such success. Without it, success is impossible.

GLOSSARY

GLOSSARY OF ACRONYMS

AFB	Air Force Base
AFEWES	Air Force Electronic Warfare Evaluation Simulator
AFOTEC	Air Force Operational Test and Evaluation Center
AGM	Air-to-Ground Missile
AIM	Air Intercept Missile
ASD	Assistant Secretary of Defense
ATF	Advanced Tactical Fighter
BES	Budget Estimate Submission
BIT	Built-In-Test
COMOPTEVFOR	Commander Operational Test and Evaluation Force (Navy)
CW	Chemical Warfare
CY	Calendar Year
DDT&E	Director, Defense Test and Evaluation
DoD	Department of Defense
DoDI	Department of Defense Instruction
DOT&E	Director, Operational Test and Evaluation
DSARC	Defense Systems Acquisition Review Council
DT	Development Test
DT&E	Developmental Test and Evaluation
ECCM	Electronic Counter-Countermeasures
ECM	Electronic Countermeasures
EW	Electronic Warfare
EXCOM	Executive Committee on Air Defense Threat Simulators
F/A	Fighter/Attack
FOE	Follow-on Evaluation
FOT&E	Follow-on Operational Test and Evaluation
FOT&E(I)	Follow-on Operational Test and Evaluation Phase I
FY	Fiscal Year
FYDP	Five Year Defense Plan
GAC	General Accounting Office
ICBM	Intercontinental Ballistic Missile
IOC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation
ITEA	International Test and Evaluation Association
JCHEM	Joint Chemical Warfare
JCS	Joint Chiefs of Staff
JTF	Joint Test Force
LOT	Limited Operational Test
LRIP	Low-Rate Initial Production

MCOTEA	Marine Corps Operational Test and Evaluation Activity
MEF	Mission Effectiveness Factor
Mk	Mark
MOT	Maturity Operational Test
MRTFB	Major Range and Test Facility Base
MS	Missile Seeker Radar
NATO	North Atlantic Treaty Organization
NF	No Foreign
OA	Operational Assessment
OPEVAL	Operational Evaluation
OSD	Office of the Secretary of Defense
OT	Operational Test
OT&E	Operational Test and Evaluation
OTEA	Operational Test and Evaluation Agency (Army)
OTO	Operational Test Organization
OUE	Operational Utility Evaluation
PDM	Program Decision Memorandum
PE	Program Element
POM	Program Objective Memorandum
QTR	Quarter
RDTE&E	Research Development Test and Evaluation
SAC	Strategic Air Command
TDY	Temporary Duty
T&E	Test and Evaluation
TEMP	Test and Evaluation Master Plan
UHF	Ultra-High Frequency
VHF	Very High Frequency